SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXIV.--No. 23. [NEW SERIES.] NEW YORK, JUNE 3, 1871. $3 per Annum. [IN ADVANCE.]

Machine for Labeling Fruit and other Cans.

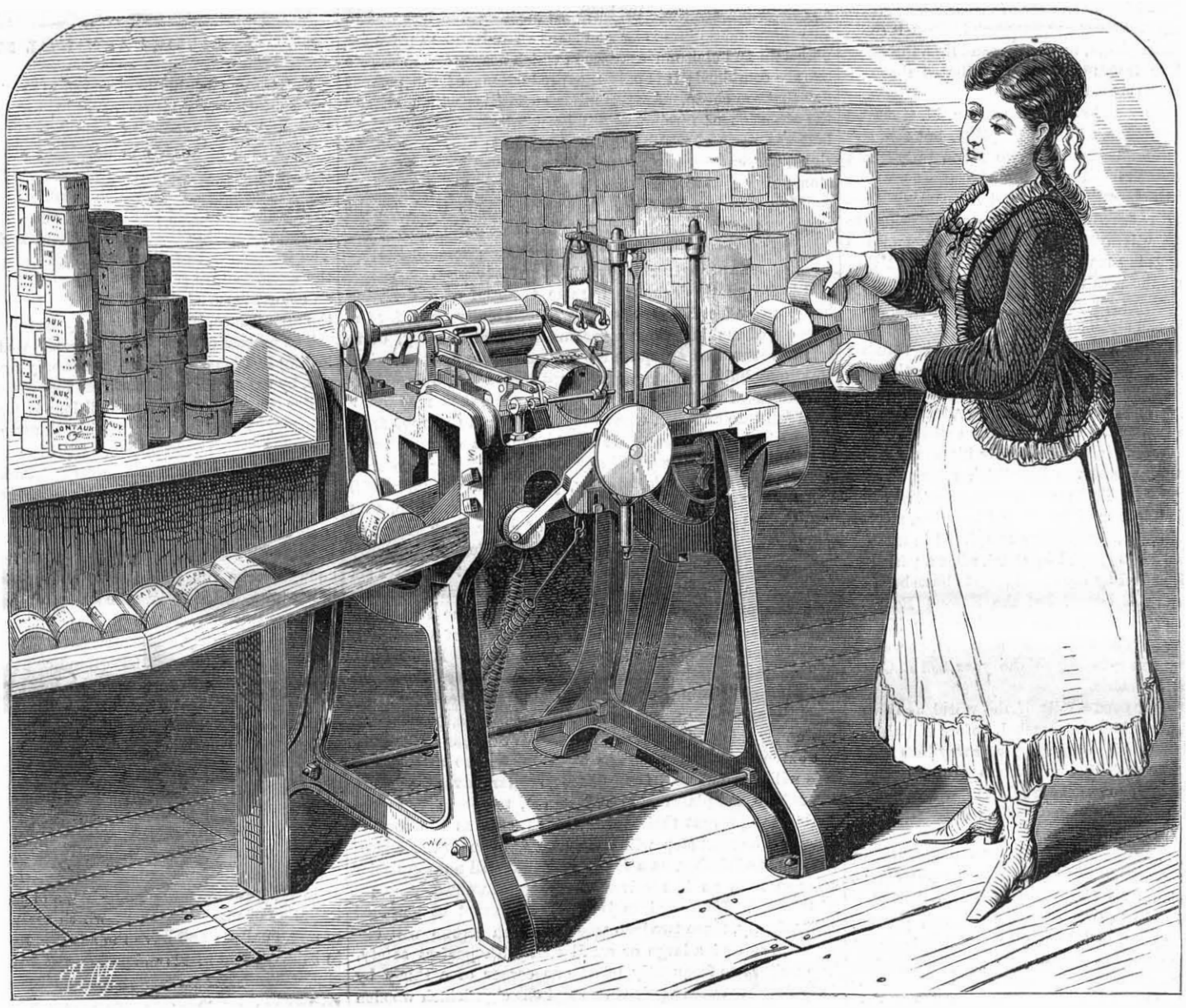
Within the past ten years the manufacture of cans for the preservation of fruit and vegetables, and the packing of oysters, for those sections where the delicious bivalves cannot be enjoyed in their native freshness, has increased to such an extent as to be one of the great staple industries of the country. Thousands who, amid the snows of winter, eat the succulent corn or the aromatic tomato, with a sort of matter-of-course feeling, have no idea what a blessing this system has been to the weary traveler on the ocean's bosom, to him who crosses the vast and almost sterile plains of the heart of our continent, to the miner in the wilds of Idaho, or the Arctic explorer.

But few of us in our daily walk to or from the great center of bustle and money getting have not paused to admire the gay display with which the tasty grocer adorns his window. The rich, many colored labels contrast prettily with the bright silvery tin, and with a dainty background of viands brought from all parts of the earth to satiate the cravings of appetite or gratify luxurious taste. It would be beyond our space as well as our intention to enumerate the vast establishments of East, West, or South, or of our own city, to give statistics of the immense business they do, the ground they cover, and the hands they employ to supply the demand for fruits and vegetables out of their natural season. So great has this demand become, that in a commercial and sanitary point of view, every improvement in their preparation for market which cheapens their production is a public benefit, even to the teeming thousands who crowd the tenement houses of our city.

The machine, of which we present an engraving this week, is designed to save the labor of labeling cans by hand, as heretofore performed. In all manufactures where cans or bottles are used, custom and a species of advertising has necessitated the use of labels. No sane business man looking to a sure sale for his goods, would now-a-days think of sending them out without labels. We need not argue the necessity of these bits of paper; whether ornamental or simply useful, they must be affixed to the cans, and the most rapid means of accomplishing that end of course tends to cheapen the cost of production. An active, vigorous hand cannot paste on bottles an average of more than 800 labels per day. If we reckon this hand to cost $5 per week, we shall have a cost of about one cent for every ten cans, or 14·4 cents per gross.

The machine to which we call attention will, it is claimed, do ten times as much with two girls to attend it. Thus two girls, with the machine, will label 8,000 cans or bottles per day of ten hours; or 48,000 per week, at a cost of $10, while the best that ten girls can average in this same time is 48,000 at a cost of $50; a clear saving to the canner, by the use of the machine, of $40 per week. This saving enables him to sell his product at least 10 cents per gross cheaper. To the general reader this would seem a small matter, but when it is recollected that Baltimore alone, last year, put up 40,000,000 cans of oysters, the sum total of saving becomes immense. Then add to this the large number of cans of fruits, vegetables, meats, coffee, spices, and condensed milk, and the large saving effected is easily to be perceived. Then view the great competition in the market, the increasing demand, and the absolute necessity of production at decreased rates, and it is evident that this machine is one of great value to manufacturers and of approximate benefit to the general public.

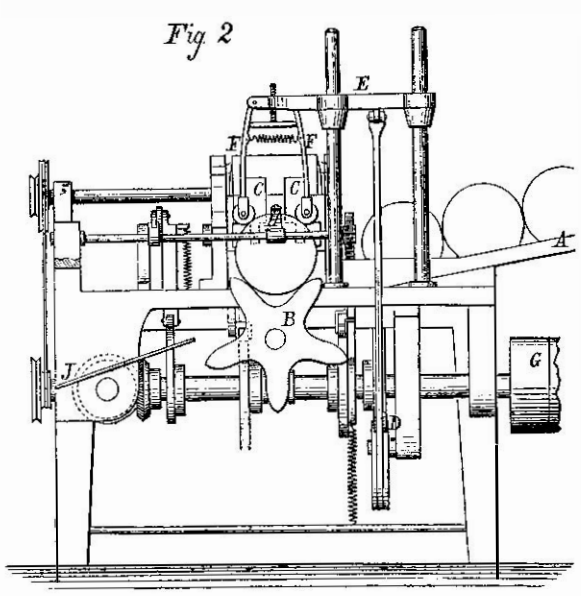
But it is not only in things edible that this machine becomes of use. Paints, oils, varnishes, tobacco, and, in short, every kind of round tin or glassware that has to be labeled comes within the scope of its operation.



TYRRELL'S MACHINE FOR LABELING FRUIT AND OTHER CANS.

The inventor has had a long experience in one of the largest paint factories in this country. In times of busy trade he saw the value and need of such a machine, and after careful effort, brought it to perfection.

The machine from which our illustration is taken has, it



is stated, been running with perfect satisfaction for over four months in the paint factory of Messrs. C. T. Raynolds & Co. It takes in four sizes of cans, and has labeled 9,000 in 10 hours.

Of course a machine can be made adjustable to the largest size cans. The power, required to run it, is hardly a tenth of a horse power, and it might be so arranged as to run by hand if desired.

Fig. 1 is a perspective view of the machine when at work Fig. 2 is a sectional detail from which the operation of the machine can be understood.

The can is fed in at the chute, A, Fig. 2, and is taken up by the revolving star, B; it is there retained in place long enough to receive the label from the gumming wings, C. The cam, D, gives downward motion to the cross-head, E, and thence to the arms, F F, with the smoothing rollers attached thereto. The can is then discharged by a partial revolution of the star, B, on to the chute, J, as shown in Fig. 1. Power is applied at G. The finger, H, holds the label in place while the gumming wings return for another label.

The patent for this machine has been granted to Edward Tyrrell, assignor to himself and L. Richardson. Rights to use or manufacture this machine, in States or counties, will be sold. For further particulars, address the patentee at 281 and 295 Plymouth St., Brooklyn, N. Y.

Kalsomining.

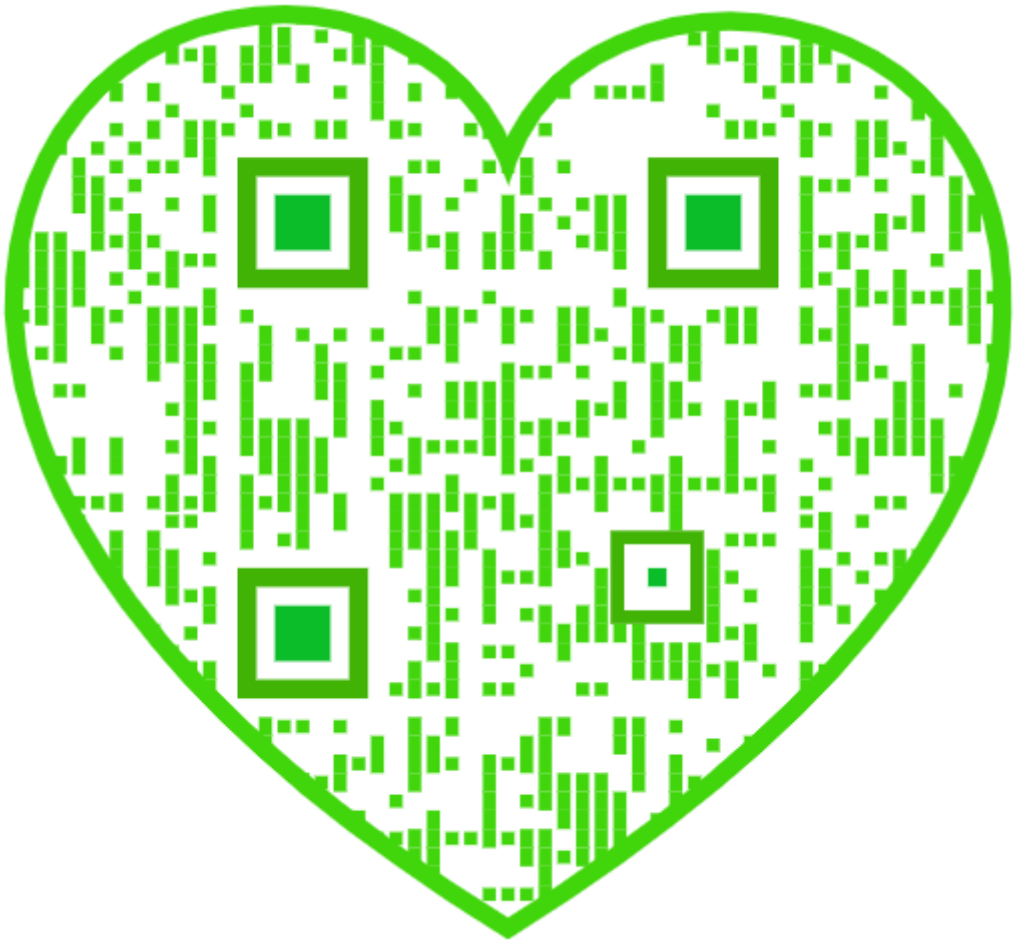
The rough unfinished appearance of a white or yellow washed wall is not its most disagreeable peculiarity. It perpetually gives off its dirt, and its own fabric in powder, to any one who brushes it with his garments, or who hangs his clothes against it. The superior smoothness and glaze of a good kalsomined wall is a great improvement to the style of the interior of a house; and if well made, such a surface is suitable to the best rooms of a good house, and is so cheap as to be within the means of the poorest. It requires care and judgment in the selection of the not expensive materials, and above all, capability and skill in applying it to the wall.

The plaster is made of Paris white, a fine powder produced by the pulverization and elutriation of common chalk, mixed with fine, clear white glue, dissolved in water. The Paris white costs about three cents a pound, but the wandering operatives who apply for jobs ask a much higher price for it.

The process should be commenced by soaking four ounces of glue in a quart of warm water for twenty or twenty-four hours; then a pint of water should be added; and the vessel (of tin or other thin metal) should be placed in a kettle of hot water over a fire, the glue being agitated till it is thoroughly dissolved and the solution quite clear. Put five or six pounds of powdered Paris white into a large bucket, and add hot water sufficient for the mixture to be of the consistency of cream. Then mix the glue water with it, stir it well, and paint the walls with the mixture with the usual whitewash brush.

It is of the utmost importance that the kalsomining mixture be spread very smoothly, and to secure this, a little hot water must be added, if the stuff be too thick for easy and level application. The quantities given above are sufficient for two coats on a large room, say one eighteen feet square; and for good work two coats should always be applied. A little care in manipulation will produce by kalsomining a neat and handsome effect, even in the hands of the most inexperienced operator.

© 1871 SCIENTIFIC AMERICAN, INC.



The Moabite Stone.

In the dreary and almost inaccessible region that lies between the mountains of Moab and Mount Pisgah, on the eastern shore of the Dead Sea, and exteuding to the Arabian Desert, there was, up to about three years since, a curious relic of a people long past away. A column of stone, forty-one inches in hight, and rather more than twenty in each of its other two dimensions, covered with an inscription of thirty-four lines, containing over a thousand letters and figures, in the ancient Hebrew tongue; such was the Moabite Stone. This inscription is stated by some scholars to be the oldest writing extant, and if we consider the hieroglyphics of Egypt to be drawings, and not writings, the opinion may be a just one; although the inscribed monuments of Egypt give most distinct and intelligible accounts of the lives and manners of their times, by means of pictorial representations.

The stone was discovered by the Rev. F. A. Klein, a member of the German community at Jerusalem, on August 19, 1868. The existence of the stone became known at about the same time, to M. Ganneau, the French Consul at Jerusalem, and to Captain Warren, who is travelling over all parts of the Holy Land, for the Palestine Exploration Association, of England. Each of these three gentlemen was anxious to obtain the stone to be forwarded to Berlin, Paris, or London; but the delay caused by the rapacity of the Arab Sheikhs who owned it, was fatal to the success of either. The Arabs regarded it with a superstitious reverence, and before it could be removed, broke it in pieces, by heating and then throwing cold water on it. The fragments were distributed throughout the neighborhood as charms.

Fortunately for history and science, however, M. Ganneau obtained a paper impression, of the inscription, but this suffered partial destruction, being torn into seven pieces in a scuffle, by the natives who had watched M. Ganneau at the work. The cast of the inscription was not irreparably damaged, and it has been restored sufficiently to allow copies to be taken. Moreover, attempts to collate the pieces of the stone itself, are now being made; and it is to be hoped that this can be done, and the invaluable contribution to history, philology, and archæology given to the world.

The inscription on the stone shows that twenty-two letters were in use in the ancient Hebrew tongue, and this number coincides with the Hebrew alphabet used in the time of David, as will be seen on reference to Psalm CXIX. The message, travelling over such a tract of history, tells that the stone was erected by Mesha, king of Moab, in commemoration of the achievement of independence by his people, they having thrown off the yoke of the Israelitish rulers, after a subjection of forty years. This revolt was fostered, and perhaps created, by injudicious and tyrannical taxation, a cause of revolution which has been notably exemplified in modern times. The land was reconquered by Omri, after a period of four years. Omri is stated by the inscription to have been an usurper to the throne of Israel, but the Second Book of Kings, which gives an account of the revolt under Mesha, does not mention him. The Scriptural accounts, as well as the inscription, concur in pointing to tho year 892 B. C., as the probable date of the stone.

Thus is laid before our eyes a relic of the world as it was just after the deaths of Ahab and Jezebel, before Elijah the Tishbite was translated, before tbe carrying away into Babylon, and before the war with Pharaoh-Necho. It was carved and set up three hundred years before Rome was a settled territory, and was a thousand years old when Jerusalem was destroyed by Titus Vespasian.

By modern arts, its strange message may be placed beyond the possibility of destruction, and be preserved for the satisfaction of the curious for twenty-seven other centuries. What changes it may see in that time, no one can predict. That the cause of progress, enlightenment, and development may go on during its future as through its past, our readers will concur with us in trusting.

In connection with this subject, we may mention that it is proposed to send to the Holy Land, an exploring expedition from this country. Much has been already done by Dr. Robinson and others of our countrymen, as well as by Captain Warren, before mentioned; and any search that may be prosecuted in this most interesting of all historical lands will certainly be rewarded by valuable discoveries. A meeting was held last week at Dr. Crosby's church, on Fourth Avenue, New York, which was largely attended, and at which a subscription was commenced. A copy of the inscription on the Moabite stone was exhibited at the meeting, and was studied with much interest. For the sake of all ancient and modern science, we wish the movement every success.

A Gas Well at Buffalo, N. Y.

The fact that a large and steady flow of gas had been obtained by boring into the earth, at various points on the lake Erie shore, led the Buffalo Gas Company to put down a well in that city in the expectation of reaching gas. The work was begun on the first of February, and is now completed. The first vein of gas was struck at the depth of 318 feet, and the gas fissures gave out their contents at nearly regular distances of twenty feet thereafter. At the depth of 630 feet, the salt water was thrown out of the well with such violence as to show there was a strong impelling force beneath it. The water was then pumped out and the well was tubed, when the gas began to flow freely. The tube, a two inch one, was lately put in, and the flow has been regular from that time, in quantity sufficient to furnish fuel for a large manufacturing establishment. At the gas house, the natural gas did the work of the ordinary fuel for the furnaces, small quantities of coke being supplied in addition now and then. In the retort house, its illuminating powers were tested through about twenty pipes. It did not work well through the ordinary burners; but these being removed and full vent allowed to it, it gave all the light necessary, as a clear, steady light is not essential for the work to be done there. The light is not bright and clear like that from coal gas, and it showed a liability to disturbance by the action of the atmosphere. The company intend to have the value of the gas thoroughly tested, and have engaged the services of Prof. Hadley to make a scientific investigation of the matter. The subterranean gas is found all the way from Buffalo to Cleveland. At Painesville, Ohio, between Erie and Cleveland, a well 550 feet deep is yielding an enormous volume of gas. This well is located about two miles from the lake.

Chinese Ornaments or Curiosities.

The patient and often ingenious workmen of China produce many articles of ornament which have a deservedly high commercial value. Our countryman, Mr. Pumpelly, states that one of the most fertile sources of amusement to the stranger in Pekin, is the walk through the streets in which are collected the curiosity stores and lapidary shops. The show cases are filled with ornaments; piles of porcelain vases of every shape; objects in bronze; étagères of heavily carved vermilion lacker ware, loaded with vases; ornaments which all the precious stones known to us are represented, excepting only the diamond, emerald, and opal. Nor, says our traveller, are their prices at all modest; five hundred to two thousand dollars is by no means an uncommon price for porcelain and cloisonnées vases in which beauty and moderate age are combined; it is only the productions of the present day that are cheap. Among other curiosities which engage the attention of foreigners are horn, glass, silk, and paper lanterns, some of which are very beautiful; also bowls, cups, rings, etc., cut from gems and stones; carved work in horn, stone, roots, metal, and wood. Hardly a ship leaves the country, says Mr. Williams, in his admirable work on the commerce of China, without some of these curiosities.

Increasing the Hight of Rooms.

It is frequently desirable to raise the roof of a dwelling house a few feet higher than it was originally built, for the purpose of making sleeping rooms in the attic story, or to render rooms that are quite too low, more pleasant and airy. But many builders dare not attempt such a job, unless they take the roof entirely down, for fear that they may get a dead-fall trap on stilts, when they have lifted the roof from its original foundation. It will be found a comparatively easy job to raise the roof of any ordinary building one foot, or six feet, with perfect safety, provided a workman will operate understandingly. Let us assume, for example, that it is desired to raise the entire roof of a dwelling house, or the roof of one wing, which is thirty feet long and twenty feet wide. If the lower ends of the rafters rest on plates six inches square, or larger, it will be better to elevate the plates with the roof, by cutting openings through the side walls about six feet from each end, to receive sticks of timber extending across the building beneath the plates. If the building has been erected with a balloon frame, there should be three sticks of square timber, one near each end, and one near the middle. Let these timbers be blocked up close to the under side of the plates. The ends of these sticks need not extend beyond the outside of the plates, so as to interfere with the cornice. If there are no collar leaves secured to the rafters, the plates must be fastened, temporarily, to the timbers, to prevent their spreading as soon as the roof is lifted. The next step will be to set a screw near the end of each stick of timber, on a foundation that will not topple nor sway as soon as it receives the superincumbent pressure of the roof. If strong iron jack screws cannot be obtained conveniently, three two-inch wooden bench screws will elevate one side of a large or small roof with perfect safety. The writer has frequently lifted one corner of a thirty by forty foot barn with a pair of two and one eighth inch wooden screws. As soon as the timbers are secured in their proper places, and the screws are set to lift one side, remove a board just below the cornice, and saw off all the studs on both sides of the building. Let all the studs at the gable end be sawn in two at a point nearly in a horizontal line with the plates, and let the gable end walls and window rise bodily with the roof. Now, let the screws be all worked together, blocking up every inch as fast as the roof rises. After one side has been elevated six inches, remove the screws to the opposite side, and elevate it about one foot, keeping the timbers beneath the plates and well blocked, as fast as the roof rises.

In case there should be a chimney resting on a closet, or on the collar beams supported by a partition, procure another wooden screw, and set it beneath the chimney. Four wooden screws will usually cost no more than the proprietors of jack screws are accustomed to charge for the use of a set of screws while performing such a job. If the screws are placed on the foundation so as to elevate the roof perpendicularly, by raising one side six inches, then the opposite side one foot, and after this, lifting each side alternately one foot, there will be no difficulty in carrying up the roof in a perpendicular direction, to any desired hight, provided the screws and the blocking are supported by a broad foundation of blocks that will not rock. Before removing the screws, see that the blocking is so secure that the roof cannot slip, in case the screws are not set perpendicularly on the opposite side. As the roof is lifted, let a plumb line be frequently employed to determine whether it is not being carried in any direction away from a perpendicular line. In case the entire roof is one inch, or more, too far to the north, let the north side be lifted one foot higher than the opposite side and be blocked up; then set the screws under the opposite side inclining about one inch per foot in hight. By this means, the roof can be carried in any desired direction, the distance of half an inch or two inches. If the screws are always set perpendicularly the roof will rise in the right direction. If, for example, the plates beneath the roof to be raised were four feet from the chamber floor, in lieu of square blocks, make a strong platform for each screw to rest on, by placing four pieces of scantling, two feet long, on the ends, for corner posts, and nailing stays from the top of one to the lower end of another. Then, let the scantling stand on strong planks resting on the floor. A crib can then be carried up, on the tops of the corner posts, with pieces of plank, or studs or boards, and the foundation will not topple. As soon as the roof has been elevated to the desired hight on one side, let the space in the side wall be filled by nailing pieces of studs to the sides of the pieces attached to the plates, and the sides of the studs beneath. Then, lift the opposite side of the roof, and secure pieces of studs to the sides of any timbers that have been sawn in two. If studs, when lapped together, be nailed firmly, the side wall will be about as strong as if the studs were of one entire piece of timber. Should there be partitions extending from the floor to the roof, tear away the base boards and saw off the studs near the floor; and let another screw be employed to carry up such portions of the structure, or let a self-acting lever, with a weight at the farther end, hold the partition wall up to the desired position as the roof is rising.—*Technologist.*

RANSOME ARTIFICIAL STONE.

F. Ransome originally prepared his artificial stone by making an intimate mixture of sand, pulverized carbonate of lime, and silicate of soda (soluble glass), and treating the mass with a solution of chloride of calcium, by which an interchange of elements took place, resulting in the fermentation of silicate of lime, which became hard, and chloride of sodium, which could be dissolved out. The silicate of lime served to combine the sand to a hard and permanent stone. The washing out of the chloride of sodium was regarded as the worst feature of the operation; and if it were neglected, an efflorescence of common salt was formed, which destroyed the appearance, if not the quality of the stone.

The process of dissolving the salt was facilitated by following Bessemer's suggestion of applying atmospheric pressure, by exhausting the air from the vessel containing it, but under the most favorable conditions it was annoying and expensive. In consequence of this, Ransome sought to modify his invention so as to dispense with the chloride of calcium solution; and after numerous experiments, arrived at the following mixture. Out of a mixture of common sand, Portland cement, ground carbonate of lime, and some silica which is soluble in caustic soda at ordinary temperature, he prepares, with soluble glass, a mass that remains plastic long enough to be run into molds, and gradually changes to a hard stone, which resists the action of heat and cold, is impervious to water, and in process of time increases in hardness and durability. Ransome explains the chemical reaction in the following way. If Portland cement, which consists of silicate of alumina and lime, be mixed with soluble soda, the latter is decomposed in such a way that its silica forms silicate of lime with the lime of the cement, while caustic soda is liberated; this latter, however, at once re-unites with the soluble silica placed there for the purpose of producing soluble glass, to be again decomposed by the Portland cement. The whole of the caustic soda does not appear to be liberated each time, but a silicate of lime and soda is produced, and in that way all of the soda is absorbed.

By the addition of fragments of quartz and oxide of iron, artificial granite can be produced, and also, in another way, imitation of marble, both of which are very hard, and admit of a fine polish; and have the advantage of the natural stone in being cast in molds and patterns of any forms.

Influence of Female Magnetism on the Compass.

A commander in the Royal mail service found his steamer some thirty miles out of her course. He was sorely troubled, and could not account for the local attraction that had sent him so far out of the way. Instruments and calculations appeared equally faultless. Sorely troubled, from having passed a sleepless, watchful night, the captain went on deck after breakfast. Seeing a lady sitting (as was her custom) and working near the binnacle, it occurred to him that probably the scissors were resting on the ledge of it. Detecting nothing of the sort, and bent on closer investigation, he discovered that her chair had an iron frame. It also, quite reasonably, flashed across him that the lady's ample crinoline was extended by steel hoops. So, mustering all his faculties, he exclaimed, with as much forgiveness and as little reproach in his tones as possible, "Madam, you have, by your local attraction, drawn my ship some forty miles from her course!"

Aeronautic Machine.

A correspondent sends us a suggestion for a governable aeronautic machine, and prefaces his description by pointing out an important fact in the science of ballooning which is generally overlooked. A body, floating in the air of any shape, must move in the direction and with the velocity of the wind that propels it, the power being indescribably uncertain and various; and thus a balloon, provided with sails, rudders, or other governing apparatus, is more likely to turn on an axis perpendicular through its center of gravity, than to be subject to the control of a guide. His idea is to have two balloons, joined by an inflexible rod, which, he argues, would be less subject to the rotating power of the wind, and be more amenable to the guide, when the course and force of the wind were unusually changeable.

© 1871 SCIENTIFIC AMERICAN, INC.

The Strains on Ships at Sea.

A paper embodying an investigation of the strains which ships undergo at sea, was read on February 9th, at the Royal Society, by Mr. E. J. Reed, C. B., late Chief Constructor of the Navy. The author, after pointing out that little or no practical progress has been made on this subject since the early part of the present century, proceeded to state that the introduction of steam navigation and of iron and steel as ship building materials, had rendered a thorough examination of it extremely necessary, and that he had consequently selected four ships as types of the various descriptions of modern vessels, namely—Her Majesty's yacht *Victoria and Albert*, as a type of long, fine-lined, lightly built ships, with great weight of engines and boilers in the middle; the *Minotaur*, as a type of long, fine-lined ships, with great weights distributed along their entire length; the *Bellerophon*, as a representative of short, stoutly built ships, with weights more concentrated; and the *Audacious*, as a model of ships with extremely concentrated weights.

The smooth water strains of all these ships were illustrated by numerous diagrams embodying the results of various calculations, and the effects of placing such ships among waves were then no less fully investigated. The great bulk of the paper consisted of detailed calculations too long to insert, but some of the facts and figures deduced were very striking. It was shown, for example, that a ship like the *Minotaur*, floating among waves 400 feet long and 25 feet high, from hollow to crest, which have a time of transit of about eight and three fourths seconds, passed in half that time from a bending or "moment" of 140,000 foot tuns, tending to break her in two by the drooping of the ends, to a reverse strain of 74,000 foot tuns, so that fifteen times per minute a "wave of strain," as Mr. Reed designated it, having these enormous quantities for its positive and negative amounts, sweeps through the fabric of her hull. The *Victoria and Albert* yacht has to undergo, in like manner, strains which tend to break her downwards at the ends with a force of 16,400 foot tuns, and in less than four seconds encounters a strain tending to break her downwards at the middle, and let her engines and boilers fall through her, equal to nearly double this amount, or 31,000 foot tuns. It is remarkable that this change of strain in this lightly built hull is proportionately greater than that of either of the ironclads. The *Bellerophon's* maximum strains in waves, similarly calculated, were 43,600 foot tuns, and 48,800 foot tuns, respectively.

In illustrating the influence which rapid changes of strain exert upon structures, the author referred to the experiments of Sir W. Fairbairn, who has shown that the joints of an iron riveted beam broke under the action of a rapidly alternating strain, although it was only one third in amount of what the beam would sustain at rest.

Mr. Reed stated that his investigations had shown many of the general principles laid down by former investigators, who had dealt with very different forms of ships, to be erroneous; and, in particular, opposed the very common notion that there is a compensating action between the strains of, and the wave actions exerted upon, very long fine-lined vessels. He further stated that while the weakness exhibited by many modern ships had induced him to enter upon these investigations, the result of them had been to convince him that calculations which had hitherto been neglected were becoming daily more and more necessary, especially as the length of steamships and the lightness of their construction in iron and steel were being very rapidly and simultaneously developed.

A Single Rail Tramway.

In thinly populated and mountainous countries, and especially in many parts of Turkey, the want of roads for internal communication is the great difficulty in the way of national progress. The present need, however, is to provide a means of traffic not much in excess of the actual or probable demand, and suited to the wants of a country, in which railroads are impossible from their cost, in which roads are useless because the natives find that carriages do not pay, and in which there can be no canals, because water will not run up hill. In the face of these conditions, Mr. J. L. Haddan, C. E., has devised a single rail tramway for conveyances, of which he gives the following description:

"Imagine a bicycle let into a longitudinal aperture in the center of the bottom of a cart, and the cart nearly touching the ground, so that only about six inches of the wheels would be visible; next, a kind of balancing pole run through the sides of the cart at right angles to the single rail on which the bicycle is to run. The two ends of the pole are to project about three feet on either side of the cart, and rest upon, and be harnessed to, the backs of two mules. The animals will thus be one at each side of the load, instead of being in frout, in the ordinary way. It would be impossible for the cart to turn over, because, in order to do so, it would have to force one mule to the ground and to lift the other in the air; and, moreover, as its floor would only be six inches above the rail, an overtip would be of no account. All the weight in the cart, if evenly distributed, would bear upon the rail, and the animals, having no load on their backs, would be able to exert considerable traction power."

Mr. Haddan thinks it an incidental advantage, that, with such a tramway, the muleteers would be compelled to keep the appointed way, instead of leaving it, as they now do, by side tracks that enable them to avoid toll bars; but, at the same time, he proposes to give the wheels broad double flanges, so that in case of need the carts would run upon any good road. He states that responsible contractors are prepared to lay his single line, with 30 lb. rails and De Bergne's pot sleepers, at a cost of £450 per mile, all sidings included.

Mr. Haddan does not consider that the utility of his invention will be limited by the precise conditions that first called for it. He not only suggests its employment for military purposes, but also for tramways in large cities; and he says that, where space is very valuable, a horse or mule on only one side of the cart would be sufficient. In towns, on bridges, and other important places, the rail might for a short distance be dispensed with; and passenger vehicles should be fitted with small friction wheels on either side, so that, if a horse should fall down, the balance of the carriage would remain undisturbed.

How Palm Leaf Hats are Made.

In America, the only places where the leaf of the palm tree is manufactured into wearing apparel are in Massachusetts. Amherst, in Hampshire County, Palmer, in Hampden, and Barre and Fitchburgh, in Worcester, are each the site of manufactories, but of these (says the Boston *Advertiser*) the first named is the largest in buildings, business, and completeness of work. Several of the others perform only a part of the whole course of operations necessary to fit the goods for market.

From Cuba the raw leaf is shipped to New London, Connecticut, in bunches of twenty five leaves each, and the stock is unloaded and placed on cars which stop at the door of the bleaching house. As delivered, the leaf is from four to five feet long. This, standing on the stock end, is closely packed in the bleaching rooms, where it is kept sixteen days Brim stone is used to whiten the leaf. The rooms are closed air-tight and the brimstone burnt in pans standing in the room. When bleached to the requisite whiteness, the next process the leaf undergoes is splitting. Nearly a third of all that passes the splitters is absolutely worthless for use here. Till recently it was thrown away; but since paper manufacturers have been straitened for material, this palm leaf has been found to make good paper. Fifty dollars a ton are paid for it at the paper mills.

After the straw is now ready to be worked into hats, all the work must be done by hand. In all the New England States, except Rhode Island, are agents of the firm who send the leaf out into the country among the wives and daughters of the farmers, by whom it is braided into hats and woven into webs for shaker hoods. Large teams are constantly passing over the rugged hills, carrying material to be braided, or the work that has been finished. The number of people who find employment in this business is very great. Little children are kept at it, for it is light work, and a nimble fingered girl of ten or twelve can earn as much in a day as an adult woman. The pay for the work is too small to make even decent wages, if the worker be not of remarkable deftness of hand, but it is, with many, a work of odd moments which would otherwise be wasted, so the frugal housewife will include in her day's work a "stent" of so much braiding to be done. In some parts of the country, chair bottoming is practiced in the same way. Country merchants frequently take the leaf and put it out in their neighborhoods. They are satisfied if no profit be made on the braiding, for they pay for it from their stores, and make the increase of business thus secured afford them a fair profit. Some, however, make a profit at both ends, and in any case the worker's recompense is a mere pittance.

The Wealth in our Western Veins.

A White Pine correspondent of the Chicago *Tribune* has a few words on new discoveries and the ways of old miners. He says:

Some new discoveries of fine milling ore have been made upon the eastern slope of White Pine Mountain, opposite Treasure Hill. Its existence in that locality had not previously been suspected. The assays reach up into the hundreds. One of the veins is three feet in width. It has been named "The Narrow Gage." Meantime, our neighboring districts of Eureka and Mineral Hill are excited over the discovery of free ore, in mines hitherto yielding only large quanties of base metal. The base ore, say the people of Eureka, almost entirely disappears, and the free ore comes in instead. This will necessitate the erection of mills, and the discontinuance of some of the smelting furnaces. A similar phenomenon to the above has been observed in one or two of the base mines of White Pine.

The depth of the snow, and threatening prospect of more, still deter many excited people from venturing forth in search of the new "land of promise" in Utah. The emigration will not set out in full strength for a month yet. Stragglers who have reached the goal write back that they can do nothing on account of the snow—a fact of which they were as well informed by starting as they are now. Americans are so fearful, always, that some other Americans, or some other people, will "get ahead" of them! They must all be first, on the ground—first on board of a ferry boat, railroad car, and everywhere else, even at the risk of life.

It does seem singular that these periodical mining excitments should startle and start, upon a weary tramp, old and experienced California miners, as well as the simple minded "greenhorns" just out from "the States." But such is the fact. Men who emigrated to the golden land in the "Fall of '49 and Spring of '50," and have been in every mining "rush" since, are now rushing into Rush Valley, and the Big and Little Cottonwood Canyons, as if Dame Fortune had actually contracted at last to fulfil their dreams in the "promised land" of the Mormons. Some reflecting persons will not go thither with a "rush," however, even at the risk of losing the "cream" of the speculation in town lots, and the chance of representing the State of Utah in Congress. They remember the early days of White Pine.

But Utah will not long be the sole inheritance of a close community of fanatics and defunct politicians. People from all parts of the Union will soon emigrate thither, attracted by the glitter of the precious metals, and the large majority of persons will be of a class that will make Utah a great State. The country is not so much of a desert as is Nevada, and agriculture among the Mormons is the principal occupation. As it is said that employment has a tendency to promote honesty in its followers, we may hope that the leaven of that almost extinct virtue will pervade the future political character of Utah, as a State and as a social community.

Underground Explorations---Visit to a Missouri Cave.

A western writer who has recently visited a cave in nearly the highest point of the Ozark Mountains, Green county, Mo., and about six miles from the city of Springfield, thus describes it:

"This cave was recently discovered by a hunter, whose dog chased a fox into it. The entrance was small, but has been so enlarged that a horse might be ridden in. In beauty it far exceeds anything of the kind of which the writer has any knowledge. As you enter you will observe hundreds of bushels of sweet potatoes, apparently as fresh as when first taken from the ground, placed in the cave last fall. Next in view will be seen, when brilliantly lighted, which the proprietor always does for his patrons, a vast profusion of splendid stalactites and stalagmites, in some cases meeting; and with a little help of the imagination, one can see statuary of rare beauty, variety, and of vast proportions, as well as dogs, cats, sheep, horses, lions and hooded women.

"The ceiling is completely decorated for a very long distance from the entrance with stalactites, resembling in many cases vast icicles, beautified by an endless profusion of smaller ones, and what have the appearance of small sea shells and fish. When the stalactites and stalagmites meet, as the formations often do, they form in some places columns of vast proportions, one of which I think is 18 feet in height, and 7 to 9 in diameter. Apparently some of these columns are beautifully draped in snowy white, resembling cloak or mantle, of beautiful, heavy woolen goods, hanging in graceful folds from the shoulders of a tall man. All the formations are white, except where they have been soiled by handling or the smoke of lamps Of course they are carbonate of lime, found only in limestone countries, and to the geologist it must be an interesting study to estimate the vast time of their formation. It is impossible to describe the varieties of these lime formations. To the traveler, a visit I think will richly pay. It is proposed to sell and deliver for $30,000, one of these columns to the Central Park Committee, New York. I believe the full extent of the cave has never been explored. In southwest Missouri are many other caves, from south of which large streams of excellent water run, in quantities sufficient for manufacturing purposes."

Asphalting Garden Walks and Street Pavements.

Gas tar is not soluble in water. Make a note of this, for it is the chief point in asphalt works—roofs, tanks, walks. roads, and the like. As well might you attempt to mix tallow with water as gas tar with water, and hence the importance of all articles being dry, that have to be united with gas tar. Now, when you get lime from the kiln (says a writer in the *Gardeners' Chronicle*), and slack it nicely by adding a large amount of cold water to cold stones of lime, the mixture will neither be cold nor wet, as one would think it ought to be, but fiery hot and apparently dry; yet there is no disputing the fact that into this dry powder you certainly did pour real water by the gallon, and it must be there now in some shape. Chemists tell us that, when fluids assume the solid form, heat is evolved, and although we may not recognize the presence of water, the gas tar will; so that in all cases where slaked lime is mixed with gas tar, it is a grave error, for water is there, and "gas tar is not soluble in water." But if you wish to get at the secret of asphalt making, pound the new lime and pass it through a fine sieve, and mix this with coal tar, and see the result. The writer was shown a large factory that was roofed with paper, and covered with gas tar and lime in this way. The owner had previously tried the slaked lime and wondered at his failure. The intelligent workman will boil his gas tar to get any moisture out of it, and having his pounded lime ready, he can add to suit his circumstances. The composition of bone is the point to be aimed at, for the bone earth by itself would be hard, but not tough, and the gelatin would be tough and clammy, but not hard; mixed together in due proportions, they are perfection.

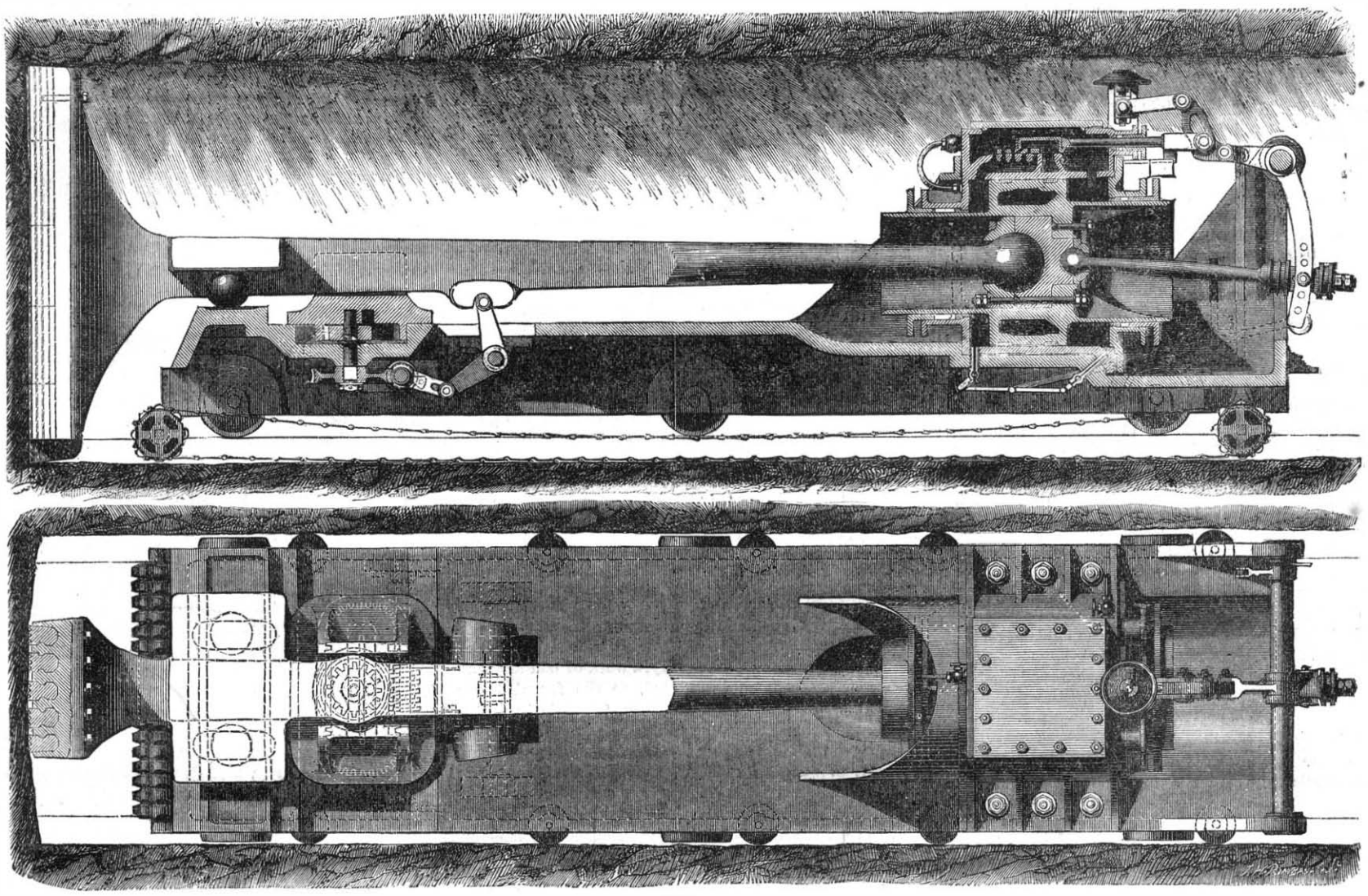
Mineral pitch used in paving is very well for street work, but when the sun is powerful, it is quite fluid; not so is the pitch when lime has been added, and as a small sample tried will give the proper proportion, there can be no excuse for having melted pitch adhering to the shoes of the passenger. Lime is able to do the master-stroke, but it must do it in its own way. If the carriage-way or foot-way is to be a permanent way, its levels must be rigidly set out first, and good hard materials used to make up the levels; while fine dry gravel, pebbles, or cracked stone, may be tarred, and levelled, and rolled, just as would be done if no tar were used. But when the stone or gravel is tarred it absorbs none, whereas the lime unites with the tar, and the compound is quite different from either of its parents. We see constantly, about any of our large towns, heaps of cinders and clinkers (scoriæ) being mixed for making footpaths, the gas tar poured on or over at random, the finer parts being left to make a smooth finish. This is good enough for parish business, and is, moreover, cheap, but whoever has seen first class asphalting in London and elsewhere, will allow that it is very nearly all that could be desired for walks or roads.

ASHLAND, formerly the home of Henry Clay, has passed into the hands of the University of Kentucky.

© 1871 SCIENTIFIC AMERICAN, INC.

Rock-Tunneling Machine.

During the past twenty years or so many machines have been designed for facilitating the excavation of tunnels or galleries in the solid rock, these machines having, with but few exceptions, been intended for boring in the rock a series of holes for receiving blasting charges. Several machines of this class have done excellent work, but they require to be withdrawn during each explosion, and the *débris* has to be removed, and the roadway and the face of the rock prepared before another set of holes can be commenced; and the loss of time occasioned by these operations, together with the fact that in many cases objections exist to the use of explosives, have led several inventors to design machines for cutting away the whole bulk of the rock to be excavated. It is a new machine of this latter class, patented by Mr. F. T. Henley, of London, England, which we illustrate this week.



HENLEY'S ROCK-TUNNELING MACHINE.

This tunneling machine may be described briefly as a horizontal steam—or compressed air—hammer, having a head furnished with cutting chisels, which are driven against the face of the rock at each blow, and provided with a traverse motion, which causes this head to move to and fro laterally, and thus cut out a gallery of rectangular section. Provision is also made for the automatic removal of the *débris*, and the machine is, in fact, intended to work on steadily day and night, only stopping under exceptional circumstances, or in the event of repairs being necessary.

The particular machine shown in our engraving is intended for cutting a gallery four feet wide by five feet high. It consists of a massive cast iron bed plate mounted on six wheels, and carrying near one end the steam or compressed air cylinder, and at the other the traversing gear by which the head is made to traverse to and fro laterally. The head is shown in our illustration made in one piece with the shaft. The shaft may, however, be in some cases made of wrought iron, and bolted or keyed to the head; this, however, is merely a question of construction, and does not affect the principle of the machine. The head extends the full depth of the gallery, and is one foot eight inches broad at the widest part. In the face of the head are formed five grooves of a kind of dovetail section, as shown, the ribs on the sides of the grooves forming the dovetail being, however, removed for a depth about twelve inches from the top of the head. The grooves receive the chisels, which are made in twelve-inch lengths, and which are inserted (the head being drawn back from the face of the rock) at the upper part of the grooves where the ribs are absent, and dropped into their places. The upper lengths are held in their places by bolts. The chisels are each made with four cutting edges, so that there are altogether twenty rows of cutting edges in the width of the head. Each of the outer rows of chisels stops short four inches from the bottom of the head, and thus the latter is made to cut a gallery having a step or ledge, four inches high by four inches wide, at each of its lower corners. These ledges serve to support the machine, the wheels, on which the latter is carried, traveling on these ledges and being thus kept clear of the *débris*. The chisels may be made of steel or of wrought iron with steel faces; but for many kinds of rock, they will serve perfectly well if made of a much cheaper material, namely, chilled cast iron. From their cutting faces being straight, they can be very readily ground, and when they are chilled castings, they will require no fitting to the grooves in the head. In the ease with which they can be made, fitted, and sharpened, these cutters form a great contrast to those used in the Penrice machine, the latter being all curved and the series of rings being all of different radii.

The shaft, formed in one piece with the head, or keyed to the latter, is furnished with a spherical end, which abuts against a wrought iron cup placed at the bottom of the front trunk of the piston, and which is held firmly in its place by a suitable gland. This gland is made in three pieces, namely, two halves of gun metal fitting the sphere, and an outer ring of wrought iron holding these halves together. The gland is tightened by bolts furnished with countersunk collars, so that they serve also to attach the wrought iron cup to the piston, and the whole arrangement is such that the thrust of the piston, when delivering a blow, throws no strain upon the bolts, the latter merely having to draw the ram back on the return stroke. At a short distance from the head, the shaft is provided with a pair of lateral projections or lugs, hollowed on their under sides where they bear upon a pair of spheres which roll on a suitable table formed on the base plate, and which carry almost the entire weight of the shaft and head. The spheres are in fact so situated that when the machine is at half stroke, they are almost directly under the center of gravity of the combined head and shaft, and thus the piston is relieved of any excessive pressure which might cause it to wear unduly. The two spheres are one foot five inches apart laterally, from center to center, and they thus form a tolerably wide base, and serve to keep the head from canting.

At a short distance from the lugs just mentioned, the shaft has a swell formed on each side of it, as shown in the plan, this portion of it fitting between a pair of guides cast on a carriage which is moved to and fro laterally by traversing gear. This gear consists, in the first place, of a lever, the upper end of which enters a recess in the under side of the ram shaft, this recess being curved to an arc struck from the center of the spherical end, formed on the shaft where the latter is attached to the piston. The lever just mentioned is fixed on a rocking shaft, which extends partially across the machine beneath the base plate, and which carries two other levers, which are coupled as shown to another pair of levers which oscillate on a second shaft, and each of which carries a pawl gripping a wheel with a V groove in its periphery, the arrangement being similar to that known as Worssam's silent feed motion. The shaft on which the V groove wheels are fixed has a double-threaded worm formed on it, and this worm drives a worm wheel fixed on a short vertical spindle, as shown. At the upper end of this spindle is a pinion which gears into a mangle rack on the under side of the carriage by which the ram is guided, and thus imparts to this carriage, and consequently to the shaft, the to-and-fro motion of which we have already spoken. The pawls which we have mentioned are set to grip their wheels during the return stroke of the ram, and it is during this return stroke, consequently, that the lateral feed is given. The rate of this lateral feed can be altered by varying the proportions of the levers, according to the nature of the materials on which the chisels have to operate.

A Night on Vesuvius during an Eruption.

Mr. F. L. Capen, of Boston, gives the following account of a night passed on Mount Vesuvius during an eruption:

On the 9th of April, a party of us, among whom were Mr. W. W. Griscom, a sound scholar and scientist from Philadelphia, and his pupil, Master S. C. Stanton, of Boston, now a resident of London—started for the scene. We reached the stream of lava before sunset, and the summit before dark. We had a close view of the new crater, at the foot of the great cone, which, having no accumulation of ejected matter, *i.e.*, no cone of stones and ashes, shows clearly how it was first formed.

A thick bed of solid rock seems to have been rent by the pent-up forces beneath, and forced upwards into a vertical position, like the jaws of a monster, broad at the base and tapering at the top. Three or four of these vast rocks form the chimney, through which pour volumes of steam and smoke, roaring flames and lava, with great violence, as if from a mighty conflagration under intense pressure below. Our party were in haste to descend, as the night drew on; but I was not satisfied, and, being on the ground, I resolved to stay till morning; and I was well repaid for my trouble and privation.

It is impossible to do justice to such a subject in a brief article. There are really three separate throats, so to speak, from the depths below, quite distinct in their mode of action. Two are within the main crater at the summit, on a line with the new one above named, which is near the N base of the great summit, or apex cone, whose action I have described. The middle throat or register is the only one that was violent in its action; and through the night, at longer or shorter intervals, it was terrific. After brief periods of rest it broke forth again with a tremendous explosion, as sudden and intense as that of the heaviest cannon, but many, many times vaster and grander, as if a magazine of powder or nitro-glycerin had suddenly been ignited far down in the deep bowels of the earth. Sometimes one, oftener several reports, came in quick succession. Sometimes the first was loudest, but often the second and third reports followed with increasing rapidity and violence, and with much greater intensity than the first. At all the explosions of this opening, immense volleys of glowing stones and hot cinders were thrown to the hight of from 100 to 200 feet, spreading into magnificent bouquets of great brilliancy, many of these stones, some of large size, falling outside the crater and rolling down the cone in glowing fragments to its base. Sometimes the explosions were preceded by subterranean rumblings far down in the deep caverns of the mountain, accompanied by a trembling of the solid frame to its very base.

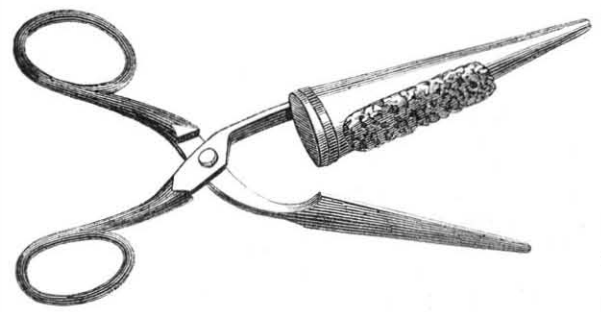
The action of the third spout or register was wholly different from the other two. There was no violent explosion, as of pent-up power, as in the case of that just described, though, like that, its delivery was fitful; blowing out at intervals, and never uniform, continuous, and unexplosive, like the first described new crater outside the cone, whose flow was a copious compressed volume of smoke and flame, as from a well-fed furnace, and with no noise, except that of constant roaring of the flames. This third register made a great blowing noise like an immense fuse, and very much

© 1871 SCIENTIFIC AMERICAN, INC.

like the noise of an ascending rocket of immense proportions. It threw out volumes of black smoke and great bouquets of glowing cinders, but with much less violence than its companion, as if the opening were much larger—so much larger in proportion to its discharge as to divest it of all explosive violence. I should regard this as the old and nearly spent crater.

APPARATUS FOR DYEING HAIR.

This is a device by the use of which hair may be dyed without staining the hand of the operator. It consists of a cone, to the side of which is attached a sponge. The cone is provided with a handle like the handle of a shears' blade.



To this handle another handle is pivoted, having formed upon it a convex blade. In use, the sponge is made the vehicle of the coloring fluid, and the hair is grasped and drawn through between it and the convex blade. This device was invented and patented in 1867, by Charles Merritt, of South Weymouth, Mass.

The First Telegraphic Instrument.

An interesting relic of the early days of telegraphy has, it is said, been discovered at Morristown, N. J. It is the first instrument by which messages were received and sent by the aid of the electric current. When Professor Morse was experimenting on the power and capability of electricity as adapted to the transmission of words, he spent a large portion of his time at Morristown, where he was assisted by Alfred Vail, esq., a practical machinist and inventor. At the Speedwell iron works of that town, then owned by the father of Mr. Vail, the experiment on the wires and on the construction of suitable instruments took place. On the completion of the experiments and the removal of Mr. Morse to Washington to bring his invention before Congress, Mr. Vail accompanied him, and, receiving the appointment of assistant superintendent of telegraphs, was stationed at Baltimore at that end of the experimental line. The instrument now at Morristown was one of two taken from Morristown by Morse and Vail—Morse using one at Washington and Vail the other at Baltimore. The first message sent was the now well known "What hath God wrought," which Morse transmitted to Vail; but the first public message was the news of the nomination of Polk to the presidency, by the Baltimore convention of 1844, sent by Vail to Morse. These instruments were in constant use for six years, when Mr. Vail, returning to Morristown, brought his with him, and where it has since remained in the possession of his family. Mr. Vail dying soon after, his instrument was specially left, by a clause in his will, to his eldest son as an heir-loom, while parts of instruments made during the experimental trials were left to Professor Morse, with a request that he would give them at some future day to the New Jersey Historical Society. The old instrument works as well as when first made, and Saturday a message was sent to New York, and a reply received at Morristown. An excellent photograph of the instrument was also taken, and with it a visit was made to Professor Morse, in New York. The professor was delighted to see the representation of the first instrument, having destroyed, as he said, the fellow instrument which he had used in 1844. He readily recognized it, and wrote a certificate across the picture as to its being a true photograph of the first instrument ever used to transmit public messages. He also expressed a wish that the photographs might be generally distributed, that it might be seen how little, in essential points, it differed with those now in use. With the exception of size and clumsiness, the instruments are almost exactly similar. The dimensions of the instrument are sixteen inches in length, seven inches in hight, six inches wide, with two magnets of three inch diameter. The paper used was two and a half inches in width, three pens being proposed to be used. The weight of the instrument is twenty pounds.

Rice's Process of obtaining Gelatine from Bones, Horn-Pith, etc.

Nathaniel B. Rice, of East Saginaw, in the county of Saginaw and State of Michigan, has invented a new process of obtaining gelatine from bone, horn-pith, etc.

The invention consists chiefly in the application, to the bone or similar substance, of phosphoric acid, which dissolves and separates the mineral constituents, leaving the gelatinous matter free and ready for use, and also in such a treatment of the acid charged with earthy matter that it can again be separated therefrom, for further use on fresh material. It is claimed that the expense of the treatment is greatly reduced by this process.

The phosphoric acid of the bone is also taken therefrom and added to the acid used for original separation, so that an actual gain of acid is effected.

The bone, horn-pith or equivalent substances is placed in dilute phosphoric acid. The earthy matter of the bone, horn-pith, etc., is thereby dissolved and removed from the gelatine, which latter can be converted into size or glue, or refined for table or other uses, by any of the known processes.

The acid is next recovered from the earthy matter, to be used for repetitions of the same process in the following manner:

About two thirds or more of the solution of acid phosphate of lime, resulting from the above process are subjected to the action of sulphurous or sulphuric acid, which precipitates the lime in the form of sulphite or sulphate, either of which can be readily removed, leaving the acid or acid phosphate, according to the amount of sulphurous or sulphuric acid used in an available condition for further use on other bone, horn-pith, etc. This process, by extracting the phosphates, originally held in the bone or other similar substance treated, yields an actual surplus of phosphoric acid, so that it is claimed, almost fifty per cent. can be gained at each process.

The residuum from the the last described process, and that part of the solution not treated with sulphurous or sulphuric acid, can be used for fertilizing or other purposes.

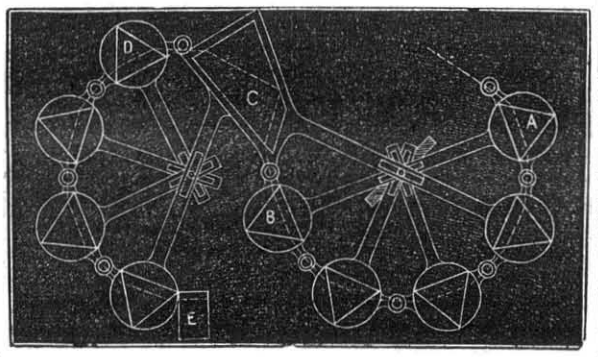
In the place of the phosphoric acid alone, a combination of it with any other acid or acids, in such proportions that the mixture will dissolve and remove the earthy matter in bone, horn-pith, or equivalent substances, may be used. But the simple phosphoric acid is more advantageous, as it acts in a satisfactory manner, and may be regained.

A NEW SPECTROSCOPE.

At a recent soirée at the Royal Society, says *The Engineer*, Mr. Browning exhibited a spectroscope in which the rays of light pass through two batteries of prisms, and are then sent back through both trains of prisms to the eye of the observer, by means of a reflecting prism placed behind the last prism of the train. In this manner a dispersive power, equal to nineteen prisms of flint glass, is obtained. Both trains of prisms, as well as the intermediate prisms, are under the control of an automatic movement, which insures that every ray shall pass at the minimum angle of deviation for the particular ray under examination. Both the collimator and telescope are fixed—the prisms only are movable. It will readily be understood that this arrangement is highly advantageous.

The D lines in the spectrum of sodium are seen in this instrument separated by an apparent interval of more than one eighth inch, and under favorable conditions of the atmosphere ten or twelve lines are visible between them.

The engraving will give an idea of the principle of construction of this powerful spectroscope. The dotted line shows the path of the rays through the two batteries of prisms. The line of light first falls on the side of the prism, A; it is then refracted by each prism successively until it



reaches B, from this it passes into the prism, C, which refracts the light at the first surface, and then totally reflects it at the second surface to the third surface, where it is once more refracted to D. It is then further successively refracted by each of the train of prisms, and sent back through the upper half of the prisms, having, in the first instance, passed through the lower half. With the exception of the hight at which the ray passes, it may be considered to retrace the path which has been already described, and to emerge again at A. For the sake of clearness, the contrivance by which motion is continued from the first to the second train of prisms, is omitted in the diagram. This spectroscope is intended for application to a very powerful telescope, for the purpose of observing the solar prominences.

Mr. Browning also exhibited a diffraction spectrum, produced by means of fine lines cut about $\frac{1}{1000}$th of an inch apart from each other on the surface of a small piece of glass. The plate was prepared by Mr. L. Rutherford, of New York.

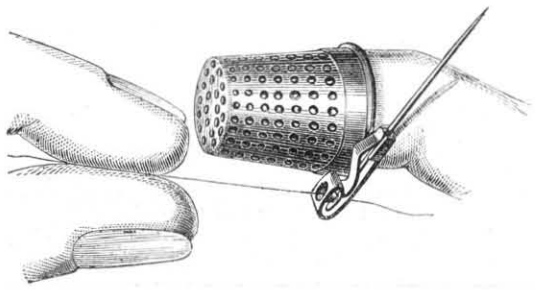
How to Preserve Fats.

Every pharmaceutist, says the *Journal of Applied Chemistry*, experiences great difficulty in the preservation of fatty compounds. During the hot weather of summer and in the warm atmosphere of the shop in winter, ointments and pomades become rancid and useless. This is particularly the case in those compounds into which animal fats enter largely. The chemistry of these changes is apparent to every intelligent pharmaceutist. The usual mode of benzoating fats is to mix with them tincture of benzoin. The objection to this is that there is often a certain quantity of moisture in lard, especially that which is steam rendered; as a consequence the tincture is decomposed, and the benzoin is thoroughly mixed. The fat of the bear, opossum and skunk, is liquid at the ordinary summer temperature, and when the tincture is mixed with them, it rises to the surface. The following mode of benzoating all kinds of animal fats will be found the most effectual for preserving them for a long time.

Make a saturated solution of gum benzoin in alcohol by simple heat, allow the liquid to settle clear, then strain and mix with equal parts of fresh castor oil. Of this mixture add four ounces to each gallon of fat or ointment while warm. The proportion of the solution of benzoin may be increased for pomades, as it forms, by its aromatic odor, an excellent basis for perfumes. The benzoatic fat should be kept not in tin, but in jars well covered. Steam rendered lard, or that treated with salt and alum, should be carefully remelted in water bath to allow all the water to settle so as to pour off the pure fat. In preparing ointment and pomades it is important that the wax should be first melted, and the oil or fat warmed before adding to the wax. This precaution, which will save much time and trouble, is often neglected by young beginners.

COMBINED THIMBLE AND NEEDLE THREADER.

A neat little device, for rapidly and easily threading needles, is shown in the accompanying engraving, and is the invention of Alex. Hunter, of Buffalo, N. Y. It consists of



a piece of metal so bent that the needle may be thrust between the two limbs of the instrument till its eye rests beneath a funnel-shaped hole which guides the end of the thread into the eye of the needle. It is a useful and tasty little instrument, calculated to save eyes and improve the temper.

Poison of the Cobra.

At the meeting of the Boston Society of Natural History, Mr. George Sceva gave the results of an experiment, which he had recently made in connection with Dr. Thomas Dwight, Jr., with the poison of the Cobra di Capello, *Naja tripudians*.

One quarter of a grain of the dried poison, which had been kept a little more than seven months, was put into twenty drops of water, the poison dissolved, and the liquid reduced by evaporation at a temperature of 85° F., to four drops. This was exposed to the air at a temperature of 22°, and was completely frozen in four minutes, the warmth of the porcelain vessel retarding the process slightly. The poison was allowed to remain in the frozen state for sixteen hours, during which time the temperature fell to 8°, or 24° below the freezing point. On the following day, the poison was thawed and diluted with three or four drops of water, and two drops of the liquid injected with a fine pointed syringe into the pectoral muscle of a pigeon, about half an inch from the keel of the sternum, the point of the syringe penetrating the muscle about one eighth of an inch. This part of the pigeon's body was selected in order to avoid wounding any of the viscera or large blood vessels.

The poison was injected at 4:32 P. M., and at a few minutes past 7, the pigeon was found dead.

Mr. Sceva then made some general remarks on the habits of the cobra, and on the action of its poison. In J. G. Wood's "Natural History of Reptiles," several pages were devoted to accounts of antidotes, such as the leaves and roots of the *Aristolochia Indica*, the "snake stone," etc. These, with a great many other reputed antidotes, had been found by recent investigation to be utterly worthless.

Mr. Sceva, during the past three years, while attached to the Indian Museum at Calcutta, had assisted Dr. Fayrer, the Professor of Surgery in the Medical College there, in his numerous experiments with the venom of poisonous snakes. Among those made to test the value of local applications was that of the actual cantery by plunging red hot irons deeply into the flesh in the places where the fangs had entered, but this failed to destroy the poison.

To show the rapid effect of the poison on the blood, Mr. Sceva read one of Dr. Fayrer's experiments that he had witnessed, in which the inguinal fold of the skin of a dog was held by two pairs of long-bladed forceps in such a manner as to include a triangular piece of about three inches in length. The cobra's fangs were applied to the middle of the free edge, and with a sharp scalpel, held in readiness, the fold of the skin was at once cut out, and yet the dog died from the effects of the poison in fifty-nine minutes. The infinitesimal portion of time during which the cobra's fangs were inserted in the tissues was sufficient to have sent the poison through the circulation beyond the reach of incision, and yet how very small must that portion have been.

Mr Sceva exhibited on the table a living specimen of the cobra, which he had brought with him from India. It was about five feet in length, and of the variety known in India as the keuteah. It had eaten nothing while it had been in his possession (since the eighth of June last), a period of seven months and ten days. He had also kept others in India for over five months without food.

He said that the common belief that the cobra would seek to exercise its deadly power by biting any person who should come within its reach, was quite erroneous. On the contrary, it avoids using its fangs as much as possible, except when securing its food.

Of the great number of deaths (some thousands) occurring annually from cobras, the bites were almost always received when people stepped upon them.

J. H. COOPER says, in the *Journal of the Franklin Institute*, "A good adhesive for leather belts is printer's ink. I have the case of a six inch belt running dry and smooth and slipping, which was entirely prevented for a year by one application of the above."

© 1871 SCIENTIFIC AMERICAN, INC.

Economizing Fuel, and Preventing Smoke.

An improved economizer, the essential feature of which is the application of a forced blast through the mass of fuel in a fireplace having no fire bars, has been patented by Mr. J. M. Stanley, of Elwy Hall, Rhyl, Wales. The inventor states that he does not confine himself to any particular kind of blast. Any of the known methods of obtaining one may be employed; but, for the sake of convenience, he generally uses a jet of steam (by preference superheated), which is injected through the nozzle of a steam pipe, having about a three-sixteenth aperture, into the mouth of a blast pipe, leading to a perforated cast iron tube, placed in the body of a fireplace, under or in front of the boiler. Thus a powerful blast is induced, and impelled through the perforated tube into the fire.

The necessary oxygen for combustion being supplied by mechanical pressure, a chimney draft is not necessary. By contracting the outlet for the waste gases, a pressure of heat and flame is made to impinge upon all the heating surfaces of the boiler, without interfering with the progress of combustion. In ordinary open fireplaces, with long chimney stacks, the greater the draft the less is the pressure of heat upon the surface of the boiler; and the quicker it passes into the chimney, the greater is the waste of fuel. The *Mining Journal* (London) states that those who have tried the experiment aver that inferior fuel will, with this apparatus, generate as much steam as superior coal in common fireplaces; and, in many cases, the small slack, such as is thrown on the waste hill at the pit, has been used with great advantage.

The invention, when applied, has a twofold effect. It economizes the consumption of fuel, by rendering the combustion of the gaseous products of the fuel more perfect, and also prevents the emission of black or opaque smoke from the chimney, and causes the heat evolved by combustion to impinge more effectively or powerfully upon or against the boiler or other heating surfaces or flues, before passing into the chimney.

In the case of Cornish and other similar tubular boilers, the front part of the boiler tube or tubes is used for the fireplace, but in lieu of the ordinary fire bars, there are introduced, along the bottom of this portion of the boiler flue or flues, a metal tube or tubes, perforated at the top and sides, as may be required; this tube may be either of a circular, elliptical, or any other suitable shape, in section according to the size or form of fireplace, and may be either in one or more pieces.

For ordinary tubular boilers, the inventor prefers to have the upper part of the metal tube, which is perforated, in loose parts, for the convenience of replacing them when worn out. This tube extends from the front part of the boiler to the bridge air chamber, and is provided with a throttle valve at the inner end, which is worked by means of a connecting rod at the front of the boiler. The bridge air chamber is formed by two parallel partitions across the flue of the boiler at the end of the fireplace; the space betwixt the two partitions forms the said air chamber, and is covered with perforated metal or brickwork. In some cases, the front part of the perforated tube is left open to the external air, and by means of a suitable pipe or pipes, a jet or jets of steam are injected into the tube for the purpose of inducing or propelling a blast, which is forced through the perforations in the said tube into the fire.

After coaling the fire, and when a partial combustion is going on in the fireplace, or black or opaque smoke is being emitted, the valve before mentioned is opened, and allows part of the air to pass directly through the tube into the bridge air chamber, and thence through the perforations at the top of the bridge. This air, in passing through the hot tube and air chamber, becomes heated sufficiently to effect the combustion of the smoke and the gaseous products of the burning fuel as they pass over the bridge. In other cases, the front part of the perforated tube is closed by means of a cast iron box, fitted with a blast pipe at the side, and an airtight door in the front, through which the ashes and refuse products of combustion may be removed; the blast may be either driven through the pipe at the side of the box by means of a fan or blowing engine, or be induced or propelled by a jet or jets of steam, as before described. By these means of supplying fireplaces or furnaces with the air necessary for the combustion of the fuel, a high chimney stack for inducing a draft is rendered unnecessary, and by contracting the outlet for the products of combustion by means of a damper or valve, the heat is caused to impinge more effectively and for a longer period against or upon the heating surface, and thus operate more powerfully than when passing over such surface in the usual way. For egg-shaped and similar boilers, a cast iron firebox is used. It may be ogee, semicircular, or elliptical in section, as the case may require. This firebox is fixed in a chamber of similar shape; its sides are perforated with holes inclined downwards to prevent the small fuel or ashes from falling into the chamber. A blast of air and steam is forced under the firebox, and through the holes into the fire, and into an air chamber formed at the end of the fireplace, as before described. A pipe, in which a throttle valve is fitted, connects the two chambers; in this case, the jet of steam is injected into a pipe or pipes placed at the end of the boiler, and leading into the chamber under the fire box. The fuel is supplied through doors, as in common boilers. For marine or locomotive boilers, a firebox is used having several perforated tubes, semicircular or quarter circular in shape, and through these the blast is forced by steam jets, as before stated. Arrangements for regulating the blast and for forming an air chamber, and also for consuming the smoke, being provided, as before described.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Steam Hygrometer.

MESSRS. EDITORS:—Ever since 1848 I have been a careful reader of your most valuable paper; and frequently, since 1852, you have honored me by inserting short articles written by me. A hundred thousand minds, in all parts of the Christian world, expand and bring forth valuable fruit through the scientific light radiated from 37 Park Row. To the careful reader, every issue is replete with valuable information; yet, to be useful to so large a variety of readers, much must be written that has more value for some than for others. Different pursuits, different habits, and different minds, must necessarily have articles specially adapted to their wants.

I read nearly all domestic and foreign scientific journals, and find none equal to yours for general diffusion of practical knowledge to the great mass of readers. Now, in a late issue of the SCIENTIFIC AMERICAN, I find an extract from a paper by Leicester Allen, Associate Editor, which I consider the most valuable paper that has been written, on the all-important subject of steam, for many years. This paper (with the invention of the steam hygrometer, by its author), will open a new era in the generation and use of steam; for now the true standard of a steam generator will be the number of foot-pounds produced by a pound of coal, and not the absurd and indecisive test of the evaporation of water. The greatest possible power with the least coal and the least water, will be the criterion.

Some fifteen years ago, I was so fully impressed with this truth that I stated my belief, before the Polytechnic branch of the American Institute, that the quantity of water was no better test of the true efficiency of a steam generator than the quantity a horse drank would be of the work he could perform. This, as a matter of course, was in debate and merely figurative. In one thing I do not agree with Mr. Allen, namely, that sectional and admittedly safe boilers do not compare favorably with tank boilers as to economy in fuel. I am well acquainted with, and have professionally examined and tested, more than fifty sectional safety boilers in use in the New England States, and have found that an economy, ranging from two to forty per cent, over cylinder, flue, tubular, or upright tubular boilers, is always produced by these safety boilers. One case is very remarkable. The celebrated tool manufacturers, Messrs. Wood, Light & Co., of Worcester, Mass., bought a boiler, which, at a careful trial at the Fair of the American Institute, evaporated nearly fourteen pounds of water per pound of coal. As the boiler is directly under the works in the midst of the workmen, they concluded to put in a safety boiler. This safety boiler evaporates only some eleven pounds of water per pound of coal, but furnishes very dry and highly elastic steam; and the same engine is doing the same work with little more than half the coal. Both boilers are of ample size to do the work easily, and have nearly the same grate area.

There are a large number of works in this section, where the same results have been obtained with safety boilers.

I hope Mr. Allen will have his "steam hygrometer" manufactured, so that engineers and large manufacturing establishments may be enabled to judge of the true value of their generators, and he will thus do much to bring steam engineering to the desired perfection, when one pound of coal will give us five horse-power instead, as is now too frequently the case, five pounds of coal giving one horse-power.

YOUR BOSTON CORRESPONDENT.

Galvanized Water Pipe.

MESSRS. EDITORS:—In your issue of May 13, 1871, you have an article upon "Galvanized Water Pipes." It seems to the writer, who does not claim to be well posted upon such topics, that there may be a wide field for investigation in regard to the thermo-electric influences at work upon metallic pipes. May not these exert a force so constantly at work that the aggregate results are not to be despised, although these results for a day, month, or even year, considered alone, are comparatively trifling? Does not any system of water water pipes connecting, by metallic and fluid mediums, two extremes of heat and cold, such as exist where one end of the system is terminated by, perhaps, hundreds of branches into as many houses, with their kitchens and water backs, and also by other branches, into manufacturing establishments, with their boilers and other steam apparatus where a high temperature is secured, and the other end of the system terminated in a spring or reservoir having a much lower temperature, develop a force constantly at work in the depletion of metal composing the pipes? Should not this force act most freely upon the cold portion of the pipes, and particularly upon any portion that might happen to be the purest, thus depleting the metal and leaving it to the force of the water to carry the material of this depletion where it can do most harm, namely: into domestic use? Is not any such force (if it does exist), intensified by using any two metals instead of one, as is the fact in all lined metallic pipes? Could it not be removed to a considerable extent, by introducing a section of rubber, gutta-percha, or other non-conducting pipe a little outside, or removed from the warm portions of the pipe, thus breaking the connection between the two extremes of temperature?

CENCI BULL.

Boston, Mass.

How do you Prove your Plumb Rule?

MESSRS. EDITORS:—An article appeared some weeks ago in the SCIENTIFIC AMERICAN entitled, "How do you Prove your Plumb Rule?" This was afterwards criticized in an article by a Georgia man, who justly claimed that the writer had lost sight of the question and given directions for *making* a plumb rule instead of a way to prove one.

The Georgian gave a pretty good way to test a plumb rule, and then proceeded to show that the first mentioned writer's method of constructing one was impractical and not likely to produce a correct tool. I think any good carpenter will agree with him.

This was followed by an article from a New Jersey man who gave the practical and most exact way to make a plumb bob, and also showing why the geometrical or "circle" way is not the best way, though perfect in theory.

Practical carpenters will indorse every word these two men said. Now comes the May number of the *Manufacturer and Builder* with the original article, which is fixed up with a pretty story of a lawyer posing a master builder in court. Now, I must say that that builder was a blockhead or was very much embarrassed, that he didn't teach the lawyer that he had got above his business, and was talking nonsense. I think the *Manufacturer and Builder* is sadly behind times in coming out thus late with the article, and rather stupid not to profit by the corrections of the Georgian and Jerseyman.

But now I wish to ask a question. All this controversy has been about "plumb bobs." Pray tell me if the Southern and Middle States carpenters still use that ancient and honorable, but (so far as this part of the country is concerned) obsolete implement? I have not seen one in use since I was a small boy, and then only by a country carpenter, who, I suppose, did not know, or could not afford the luxury of a good spirit plumb and level.

I could give a better test for proving either a level or plumb. But I cannot believe there is any builder who cannot originate ways and means for himself.

A MAINE CARPENTER.

[Our correspondent is making the not very common mistake of supposing that most people know as much as he does. Give us the better rule.—EDS.

Fallacies in Building.

To suppose that timber, growing in the woods or floating in water today, can be placed in a building next week, and stay where it is put.

That if such timber be used, the walls will not crack.

That the base, window panels, casings, etc., made of such timber, will not part company with the floors from one fourth to three fourths of an inch in less than a year, and that the builder put unseasoned lumber in the latter.

That kiln dried lumber is as good as lumber thoroughly air seasoned, or that the atmosphere has no influence upon it.

That a joint once tight will always remain so.

That if trimmings be put up before plastering, or trimmed on green walls, that putty will not be in great demand when they dry.

That hot air from a furnace will not start and open every piece of wood work with which it comes in contact, nine times out of ten.

That if partitions be not properly braced, bridged, and secured at angles, that plastering will not crack.

That ceilings are less likely to crack if cross-furred.

That a pailful of lime to a cartload of sand will make mortar of any practical use, either for plastering or brick work.

That it injures mortar by mixing it some time before using it, or that if mixed one day and applied the next, it won't blister and crack.

That a cement roof, so soft that it fills the leaders in summer, or so hard it cracks in winter, will not occasion the want of new ceilings in a little time.

That a "botch" can build as good a building as a thorough mechanic.

That in all cases money is saved by contracting with the lowest bidder.

That all knowledge in relation to building is embodied in every one who signs "Architect" after his name.

That architects and builders never "lay in together," and owners never get "shorn" through that little arrangement.

That architects, as a rule, get no other commissions on buildings except the traditional "five per cent on the cost."

That builders always carry out plans and specifications to the letter.

That there are no high-minded, conscientious, competent architects, and no honest, reliable builders; and that either class does not bear a reputation equal to that of any other business men.

That a builder does not require an extended theoretical, nor an architect as extended a practical knowledge, to be successful.

That no builder can be a successful architect, or that a practical architect cannot be a successful builder.

That you, reader, without practical knowledge, know a great deal more about the details of a house than of a locomotive.

JOHN HENRY.

Paterson, N. J.

PROPORTION OF SLIDING SURFACES.—We see a reference in one of our cotemporaries to the fact, that if sliding surfaces are equal to each other, they will wear true and straight, while if one be smaller than the other, the smaller will wear convex and the latter concave. The reason of this is obvious on a little reflection. In the case of equal surfaces, the wearing action will be greatest on the parts which are always in contact, and will diminish to the outer extremities. As, however, the conditions are identical for each surface, this will tend to make both concave, by which the bearing will be brought upon the ends, until these are reduced to a normal condition. With unequal surfaces, however, the longer becoming concave through the greater wear of its middle portions, the shorter grinds away to fit it.

© 1871 SCIENTIFIC AMERICAN, INC.

A FEW CORRECTIONS OF THE METHOD OF DETERMINING THE PERCENTAGE OF WATER MECHANICALLY SUSPENDED IN STEAM DELIVERED FROM BOILERS WHICH PRIME.

BY P. H. VANDER WEYDE, M.D.

It is only in the interest of science that I feel called upon to draw attention to the existence of some errors in the calculation of the amount of priming of steam boilers, given by Mr. Leicester Allen, page 313 of this volume of the SCIENTIFIC AMERICAN. So long as they remain uncorrected, a conflict of scientific theory and practical experience must result; as, by the method there laid down, good boilers delivering dry steam will be accused of considerable priming, moderate boilers will be supposed to be some 30 per cent worse than they are, and only such boilers as deliver very highly superheated steam, would be considered not to prime.

The suggestion of the method itself (the application of the difference, in latent heat, of steam and water, as a practical test of one of the most important qualities of steam boilers), I consider as very ingenious, and creditable to Mr. Allen; and it is only for this reason that I have taken the trouble to write this communication, which I trust will be a useful contribution to an important subject, and to the so ardently desired ageement between theory and practice.

There are seven errors in the calculation—two in the making up of the formula, three in the use of the formula, and two in arithmetic—one in multiplication and one in division.

The first error is, that the latent heat of steam is accepted as 1,178 units, counting them from the zero of Fahrenheit; while it is clear that, in order to heat water of 80° above that point, all the units derived from the heat below that temperature are not available, and must not be counted.

The second error is of the same nature; counting the units of latent heat of water at 212°, as 212 units, he again counts 80 units from zero for the heat up to 80°; while, in fact, zero Fahrenheit is an arbitrary point—32° below freezing—with which, in this case, we have nothing to do.

The third error is made in the attempt to correct these errors in the making up of the formula, and is, in fact, an acknowledgment of the same. A subtraction is made of 5×80, or 400 units, for the heat in 5 lbs. of water heated above 80°, but a similar subtraction is not made for the units of heat derived from the temperature below 80° in the half lb. of steam used.

The fourth error is arithmetical, and of minor importance. It is in the calculation of the units of heat contained in 5½ lbs. of water of 180°. This should be 5½×180, or 990, and not 960, as stated, and used in the further calculation. This would give for b=590, or corrected from the first error also, 550.

The fifth error is of a more serious nature; it is in applying the value ½ for a, in the formula:

$$x=\frac{1178\,a-b}{966}.$$

The formula is made by Mr. A.,

$x=\frac{1178-560}{966\times 2}$, which is equivalent to $x=\frac{1178\times\frac{1}{2}-590\times\frac{1}{2}}{966}$

and therefore all wrong, as we must multiply only 1178 with $a=\frac{1}{2}$, and not b or 560 with a or ½. The formula should be

$x=\frac{1178\times\frac{1}{2}-560}{956}=\frac{589-560}{966}=\frac{29}{966}$, which would correspond with only 3 per cent priming in place of over 31, as found on page 313; but in this reasoning is contained:

The sixth error. This is very grave also. The value of x is here considered by Mr. A. to be the proportion of water in a unit of steam, as is evident from his calculation of the percentage which he finds by dividing 100×(1178—560), or 100×618, by 966×2, or 1932. Now this again is wrong, as the formula has been based on the assnmption that x shall "represent the water in pounds," $x+y=a=\frac{1}{2}$lb. Therefore the value found for x is the direct amount of water in half a pound of steam, which must be doubled to find its amount in one pound, and then the percentage would be (assuming the other figures to be correct) 100×618×2, divided by 966×2, or $63\frac{5}{16}$ per cent of water. The correction of this error makes matters worse; but applying it to the partially corrected calculation, which gave 3 per cent, it would bring it to only 6 per cent.

The seventh error is in the final fraction, $\frac{9\,0\,8}{1\,9\,3\,2}$, in place of $\frac{1\,0\,0\,8}{1\,9\,3\,2}$, but this may be typographical, and is, besides, of little importance comparatively.

Applying now these corrections to the example given, where half a pound of steam has raised the temperature of 5 lbs. of water 100°, so as to have a mass of 5½ lbs., its units of heat, b, must be 5½×100, or 550, while a is ½. Applying these values for a and b, in the corrected formula,

$$x=\frac{1098\,a-b}{966},$$

we have

$$x=\frac{1098\times\frac{1}{2}-550}{966}=\frac{549-550}{966}=\frac{-1}{966},$$

which means a deficiency of $\frac{1}{966}$ of water in ½ lb. steam, or $\frac{1}{483}$ lbs. of water in 1 lb. of steam, or about one half of one per cent. The steam is thus slightly superheated, and could still absorb this small amount of water and yet be dry steam, a result quite different from that found, namely, 313, or over 31 per cent of water.

Before dismissing the subject, it may be well to test this surprising result by inverting the operation, and calculating backward. Let us investigate what the result must be when 5 lbs. of water of 80° is heated by half a pound of puro dry steam of 212°. Such steam contains one half of 966 units of latent heat, and one half of 212—80 units of sensible heat available to heat water of 80°; this gives ½ (966+212—80= 549 heat units, which divided in 5½ of the resultant amount of water, gives $\frac{4}{5}\frac{9}{5}$, or 99·8°, not quite 100°, bringing its temperature to 80+99·8, or 179·8°. It is thus seen that perfectly pure and dry steam can, under the given conditions, not possibly heat water to 180°, which is a perfect corroboration of the above criticism, and a proof that the result of obtaining in the example given, a negative value for x is strictly correct.

In a similar way, it is easily ascertained how much one half pound wet steam, containing 31 per cent of water, must heat five pounds of water of 80°; it consists of one sixth of a pound of water and two sixths of a pound of steam. The units of heat in the steam are nearly 323, and in the water 62, total 385. This, divided by the 5·5 lbs. of water, gives an increase in temperature of 70°, bringing it to 80°+70°, or 150°, in place of 180° as found on page 313.

I could easily prove that the absorption of heat by the copper lining, with unavoidable losses of heat by the manipulation, require another correction in favor of the boilers tested, as without these losses of heat, the five pounds of water would obtain a temperature of some two, three, or four degrees higher, which we ought, in order to be just, to credit to boilers tested. Taking this into account, the value for x, found in the above example, becomes about two per cent negative, proving the steam to be not only dry and without water, but considerably superheated.

REPLY TO THE ABOVE, BY L. ALLEN.

The paper which I find is complimented by the criticism of a man of such acknowledged scientific acumen as Dr. Vander Weyde, was written at the urgent request of the President of the Society of Practical Engineering—a request made at 4 o'clock P.M. on the day previous to the reading, the method of testing steam having been some time previously explained verbally to him. Pressure of other duties too important to be neglected, postponed the writing till late at night. The paper had not even a revision before it was read. Under such circumstances of haste, it would not be surprising that some purely arithmetical errors crept into the calculation, more especially as, having found the standards of quantity of water and steam I had been using inconvenient, I hastily changed them to the ones named in the paper. I shall show that the errors are only in the application of the formula to the quantities named, and not at all in the construction of the formula. Meanwhile, I am much obliged to Dr. Vander Weyde for calling my attention to these mistakes, as I should probably otherwise have passed them unnoticed, although they are apparent at a glance, now that my attention is called to them. So long as the principle is sound, and the formula deduced therefrom correct, and the method is in itself pronounced essentially valuable by others of known scientific attainments, I may well be content that nothing worse than a few stray figures and a transposition of a factor, from a numerator to a denominator of a fraction, are all the flaws so acute an observer as Dr. Vander Weyde can fasten upon my humble production. These mistakes could mislead no one capable of understanding and working a simple equation.

As to the correctness of the formula, Dr. Vander Weyde asserts that I assume the latent heat of water at 212° to be 212 heat units, and the latent heat of steam at 212° to be 1,178 heat units. If he will again look at the paper in question, he will see that I assert no such thing. I *do* assume the *total number* of units of heat in steam at 212° to be 1,178, and the *total number* of units of heat in water at 212° to be 212, an assumption usually made in calculations relative to latent heat of steam, and which, while it abbreviates the calculation, gives results as exact as to compute the total from ice at zero, as the following comparison of the two methods will show:

DR. VANDER WEYDE'S METHOD.

No. of units of heat required to raise 1 lb. of ice from zero to 32°	= 16·1
No. of units of heat required to change 1 lb. of ice at 32° into water at 32°	=142·4
No. of units required to raise 1 lb. of water from 32° to 80°	= 48·0
Total units of heat required to convert 1 lb. of ice at zero into water at 80°	=206·5

Multiplying this by 5, we have for the total number of units of heat in 5 pounds of water at 80°=206·5×5=1,032·5 heat nnits.

In the same manner, the total number of units of heat after the water has been raised to 180° by the admission of steam, and increased in weight ½ pound, will be found to be 306·5×5·5=1,685·75. The heat added by the induction of steam will therefore be 1,685·75—1,032·5 heat units=653·25 heat units.

The formula should, on this basis, be changed from $x=\frac{1178a-b}{966}$, to $x=\frac{1304{\cdot}5a-b}{966}$, and as a represents 0·5 lb., and b has been found to be 653·25, we have

$$x=\frac{652{\cdot}25-653{\cdot}25}{966}=\frac{-1}{966}$$

a result which shows that the steam admitted in the example is slightly superheated, as Dr. Vander Weyde has shown, instead of containing water, as the errors in working my formula made the result indicate.

Now working my formula correctly, we have

$$x=\frac{1178a-b}{966}=\frac{589-590}{966}=\frac{-1}{966}$$

the same result as obtained by Dr. Vander Weyde's calculation, showing that, for all purposes of calculation, the results will not be altered by assuming the total number of units of heat, in a pound of steam at 212° to be 1,178, and the total number of units of heat in a pound of water at 212° to be 212. In making this assumption, I followed the example of many standard writers on steam, well known to engineers, and with whose works Dr. Vander Weyde must be well acquainted. The work is thus shortened by the absence of decimals, and the numbers are more convenient. Had I supposed for a moment this assumption would have led to a misconception in the miud of any one sufficiently acqnainted with the physics of heat to understand the principle of the method, I should have adopted the extended mode of calculation, instead of the abbreviated one, although the results attained are the same. With regard to the absorption of heat by the copper lining of the steam hygrometer, and other losses during manipulation, I think they are deemed by Dr. Vander Weyde of greater importanee than they really are found to be in practice; but it is easy to make the necessary corrections, should it be found essential to do so. The specific heat of copper is 0·09515. The lining of the water chamber of the instrument weighs about 0·5 pound; it would therefore absorb from 80° to 180° only 4·75 heat units.

Things Worth Knowing.

J. H. T., in the *Coach-Makers' International Journal*, gives the following recipes:

TO COUNTERFEIT TORTOISE SHELL, VERY FINELY.—In order to do this well, your foundation or ground work must be perfectly smooth and white, or nearly so; you then gild it with silver leaf with slow size, so as to have it perfectly smooth, with no ragged edges, cleaning the loose leaf off. Then grind Cologne earth very fine, and mix it with gum water and common size; and with this, having added more gum water than it was ground with, spot or cloud the ground work, having a fine shell to imitate; and when this is done, you will perceive several reds, lighter and darker, appear on the edges of the black, and many times lie in streaks on the transparent part of the shell. To imitate this finely, grind *sanguis draconis* with gum water, and with a fine pencil draw those warm reds, flushing it in about the dark places more thickly; but fainter and fainter and thinner, with less color towards the lighter parts, so sweetening it that it may in a manner lose the red, being sunk in the silver or or more transparent parts. When it is dry, give it a coat of varnish, let it stand a few days, then rub it down with pumice stone and water. Then grind gamboge very fine, and mix with varnish, giving of this as many coats as will cause the silver to have a golden color, then finish with a clean coat of varnish.

HOW TO CLEAN ALABASTER.—Take ground pumice stone of the finest quality, and mix it up with verjuice; let it stand for two hours, then dip in a sponge and rub the alabaster therewith; wash it with a linen cloth and fresh water, and dry it with clean linen rags. Any kind of marble may be done in the same manner.

TO CLEAN SILVER OR GOLD LACE.—Lay the lace smooth on a woolen carpet or piece of woolen cloth, and brush it free from dust, then burn rock alum and powder it fine, and afterwards sift it through a lawn sieve; then rub it over the lace with a fine brush, and in so doing it will take off the tarnish and restore it to its brightness, if it be not too much worn on the threads.

HOW TO MAKE ARTIFICIAL MARBLE FOR PAPER WEIGHTS OR OTHER FANCY ARTICLES.—Soak plaster of Paris in a solution of alum; bake it in an oven, and then grind it to a powder. In using, mix it with water, and to produce the clouds and veins, stir in any *dry* color you wish; this will become very hard and is susceptible of a very high polish.

Plague in Buenos Ayres.

Letters recently arrived from Buenos Ayres, giving sad and distressing accounts of a terrible visitation of yellow fever to that city, during the months of March and April. The fever was exceedingly virulent in the whole city, and neither the strong nor the well nurtured were spared by it. It is stated that nearly one hundred thousand people left the city in a few days, the terror being justified by the sconrge, which destroyed, in some instances, whole families in a single night. The panic was such that the suburbs and surrounding country became over-crowded, and lodging could not be obtained. On March 29, the mortality reached the appalling figure of 367, and the whole state of society seems to have been upset.

At a meeting of merchants at the Exchange, it was agreed to suspend all business, and to grant an extension of sixty days to all debtors and on all pecuniary obligations; and although the arrangement did not receive legal sanction, it has been practically carried out by the benevolent tolerance of all holders of securities. The devotion of all classes to the afflicted or bereaved is deserving of the highest laudation; a great many sanitary and relief commissions are appointed, and the exemplary conduct of the entire population is worthy of great commendation. Money subscriptions in aid of the sufferers are ouring in from all quarters. Such visitations seldom fail to show us the sad spectacle of good men falling victims to their own charity and disinterestedness, and a great number of those whom Buenos Ayres could ill spare have fallen, among whom the President of the General Relief Committee, Don Roque Perez, may be numbered.

We are informed that this is the first visitation of yellow fever to Buenos Ayres, and that the contagion was imported from Paraguay. Our advices unite in considering the affliction so severe as to be a certain check on the rising prosperity of the country.

CATGUT is the name applied to strings, made chiefly from the intestines of sheep, used for harp, violin, guitar and bow strings, hatters' strings, etc. It is said that the best strings are made in Naples, because the Italian sheep, from their leanness, afford the best raw material—the membranes of lean animals being tougher than those of animals in high condition. The same name is also given to a species of linen or canvas with wide interstices.

© 1871 SCIENTIFIC AMERICAN, INC.

Improved Furnace Grate.

Our engraving illustrates a furnace grate, patented Feb. 28, 1871, by G. W. Hildreth, of Lockport, N. Y. The grate is intended to burn anthracite coal screenings, without any preparation or the admixture of any other fuel. The inventor claims that, by the use of this grate, such screenings may be successfully used as fuel for the generation of steam. He further informs us that one has been in constant use since June, 1870, with perfect success, the fire not having gone out in a single instance during the day.

The grate bars, when closed, form a level, smooth, and imperforate upper surface; and, when open, form a series of inclined upper surfaces, upon which the coal dust, or fine coal, may rest and burn, while the air is admitted between them.

By working the shake handle laterally the grate is opened or closed. There being teeth or cogs on one side only of the shake handle pinion, only the front half or the rear half of the grate is opened or shaken, at the same time, the racks being respectively pivoted to the bar in the front and rear halves of the grate. This allows the grate to be used with as large or as small openings as may be desired. One half of the grate only may be used when a smaller fire is needed. The working of the shake handle also shakes the grate for clearing the fire of ashes.

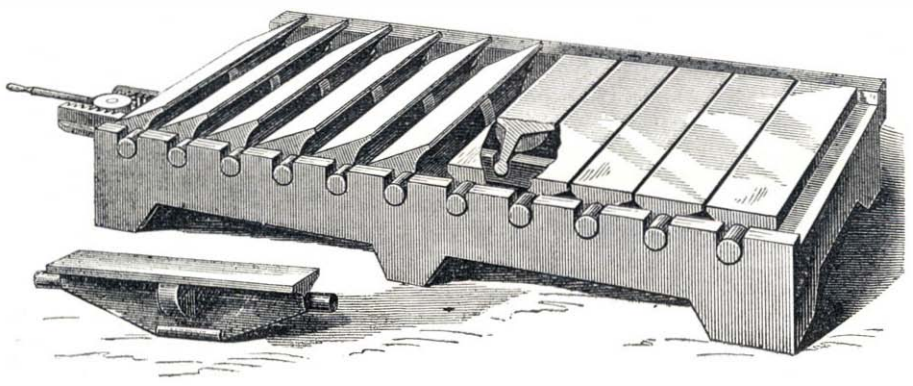
A blower may be used, discharging a blast into the ash pit, or a plain chimney draft, according to particular exigencies.

We are informed that the grates, after eleven months' use, show no signs of burning out or warping, being as good as when first put in. The fire being kept on the top of the grates, they are kept much cooler than grates of some other forms.

Coal screenings can be obtained in most of our cities at scarcely more than the expense of handling, and at the mines are without limit or cost.

It is claimed that these grates are as effective as any other for burning coarse coal or wood, and that they will burn sawdust perfectly.

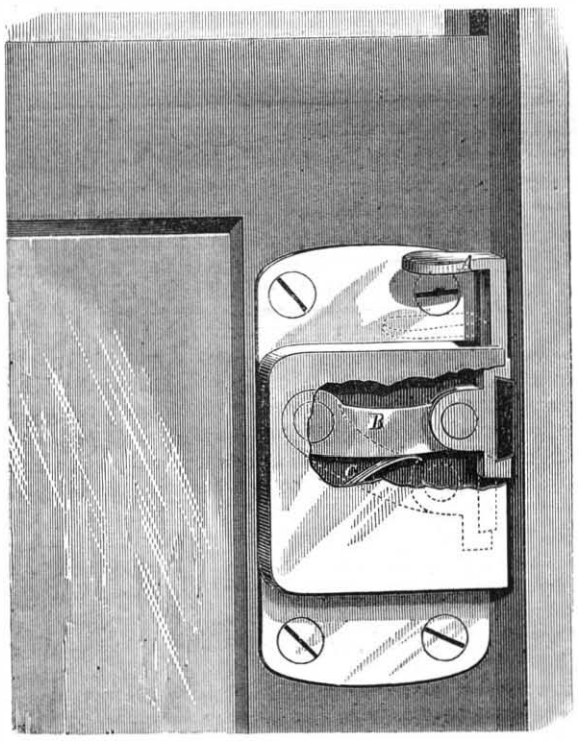
For further information address G. W. Hildreth, Lockport, N. Y.



HILDRETH'S FURNACE GRATE.

SASH LOCK.

Our engraving represents a very neat, simple, and efficient sash lock, which is, in our opinion, well adapted for use on the sashes or blinds of railway cars, as well as on windows in dwellings, and which can be made to compete, in cost, with



almost any in market. A good, convenient fastening of this kind has long been demanded by the traveling public.

Its construction and operation will be understood from the engraving. A is the catch piece, pivoted to the bar, B. The bar, B, turns radially on a pivot at the opposite end from A, and is forced upward by a spring, C. The catch piece, A, is faced with india-rubber on the side which engages the jamb of the window, and the bar, B, being slightly longer than will allow the catch piece to turn by its point of contact with the jamb, operates like a toggle joint, to press the catch piece against the jamb whenever the sash seeks to descend. In this way the sash is firmly wedged in the frame, so that it cannot fall. The rubber, while it affords a good hold to the catch, obviates all defacement of the wood work.

On the contrary, when it is desired to raise the sash, the upward motion of the sash immediately releases the catch piece, so that the thumb piece formed upon the upper part of the catch piece is not used except when it is desired to lower the sash. In this case, pressing upon the thumb piece disengages the catch piece from its pressure on the jamb.

Patented March 21, 1871, by P. B. Hovey, New London, Conn. The whole or a portion of the right will be sold. Address the patentee for further information.

The timber on 600 acres of land on Welsh Mountain, near Reading, Pa., was burned lately.

Electricity as a Motive Power.

In our issue for December 15, 1870, says the *Technologist*, we expressed our fears that the articles written by the Rev. Mr. Highton, and published in a journal of such recognized authority and extensive circulation as the *Chemical News*, would lead to a great amount of wasted effort on the part of oversanguine inventors. The result has confirmed our anticipations. Already applications are passing into the Patent Office at an unprecedentedly rapid rate, and every few days we find an announcement to the effect that some lucky inventor has devised an electromotor whereby an engine of enormous power may be driven for weeks with an infinitesimally small amount of zinc. And as there are hosts of sanguine but unscientific inventors throughout the country, who think that each has just as good a chance to be the successful man as any one else, these reports are setting all our inventors wild with excitement. It may be well, therefore, for us to say that thus far we have no trustworthy accounts of any engine exhibiting a marked superiority over those that have been known to the scientific world for some years. Moreover, the ablest scientific men of England have expressed their dissent from Mr. Highton's views, and have shown the fallacy of his arguments. We may add further, that Mr. Highton's papers do not seem to be based upon any experiments he himself has made, but upon theoretical deductions from old experiments of Joule, Jacobi, and others, many of which were made a quarter of a century ago, and in a comparatively rude way. As a still further general objection to the theories of Mr. Highton, we would say that he confounds and mixes up force, work, energy, etc., in a most ludicrous manner, and that such minor points as time and space, which are regarded by most engineers as of paramount importance, are looked upon by him as not worth taking into account. Now, the shortest and most conclusive way for Mr. Highton to prove that a given amount of zinc, consumed in a galvanic battery, will produce an unlimited amount of power, is to show it by a practical experiment. Half the time and labor that he has spent in writing about this question would have served to submit it to a crucial experimental test; but then it is a great deal easier to write than to experiment, and, moreover, work done in the study with the pen, brings notoriety more readily than work done in the laboratory. For the present, at least, we would recommend our readers to be cautious about investing in electromagnetic engines.

Oil Well Torpedoes.

In a recent trial at Pittsburgh, before Judge Strong, of the United States Circuit Court, the Roberts patent for increasing the flow of oil wells, by the firing therein of torpedoes, was fully sustained.

The patent consists in sinking to the bottom of the well, or to that portion of it which passes through the oil-bearing rocks, a watertight flask, containing gunpowder or other powerful explosive material, the flask being a little less in diameter than the diameter of the bore, to enable it to slide down easily. This torpedo, or flask, is so constructed that its contents may be ignited either by means of caps, with a weight falling upon them, or by fulminating powder, placed so that it can be exploded by a movable wire, or by electricity, or by any of the known means used for exploding shells, torpedoes, or cartridges under water. When the flask has been sunk to the desired position, the well is filled with water, if not already filled, thus making a water tamping, and confining the effect of the explosion to the rock in the immediate vicinity of the flask, and leaving other parts of the rock surrounding the well not materially affected. When these arrangements have been completed, the contents of the flask are exploded by the means already mentioned, and, as the evidence showed, with the result, in most instances, of increasing the flow of oil very largely.

The theory of the inventor is, that petroleum, or oil taken from oil wells, is, before it is removed, contained in seams or crevices, usually in the second or third stratum of sandstone or other rock abounding in the oil regions. These seams or crevices, being of different dimensions, and irregularly located, a well sunk through the oil-bearing rock may not touch any of them, and thus may obtain no oil, though it may pass very near the crevices; or it may in its passage downward touch only small seams, or make small apertures into neighboring crevices containing oil, in either of which cases the seams or the apertures are liable to become clogged by substances in the well or in the oil. The torpedo breaks through these obstructions, and permits the oil to reach the well.

Judge Strong, in delivering the opinion of the Court, holds that while the general idea of using torpedoes for the purpose specified is not patentable, the particular method of employing them invented by Mr. Roberts is patentable, and therefore that he is entitled to protection.

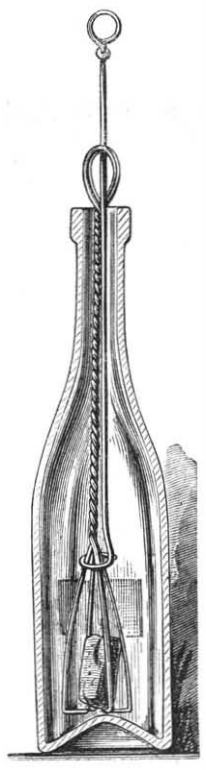
Boxwood.

It is surprising to what perfection engraving on wood has been brought. A few years ago a woodcut might have been readily distinguished from all other illustrations by the coarseness of the engraving. At present, we find some of the best artists devoting their time to delineating on wood, and such is the delicacy of the drawings, the highest skill of the engraver is required to preserve the effect produced by the masterly use of India ink, the lead pencil, and China white. The pictures in the illustrated journals, such as Leslie's, Harper's, *American Agriculturist*, Appleton's *Journal*, SCIENTIFIC AMERICAN, and others, are all cut in boxwood. Boxwood, as is well known, grows in different parts of the world. The bulk, however, of that which is used in this country is imported from Turkey. The growth of the tree is slow. If it be twelve inches in diameter, its age is to be numbered by centuries, for it is above 500 years old. Those trees which attain a diameter of eighteen inches are about 1,000 years old. Block makers prefer trees eight to ten inches in diameter. The wood is sold by the tun, is very costly, and is of such various qualities that not more than an eighth or a tenth part of a tun is suitable for the finest engravings.

The best quality of wood is of a bright canary color, the texture fine and close, and the surface free from dark markings; great care is required in preparing the blocks. After the wood in the log has been sawn up into sections of a proper thickness, and becomes thoroughly seasoned, it is ready to be cut into blocks, and here one may see what an amount of waste wood there is. Checks and other imperfections require close cutting of the sound wood, and as these pieces are necessarily small, several must be joined together to form a large block.

Blocks, the size of our fashion plates, are composed of from four to six different pieces, fitted, doweled, and glued together with such extreme nicety as to present the appearance of a solid piece. Large blocks are generally joined together with screws, so as to admit of being taken apart for engraving, and re-united when ready for the printer.—*Coach-Makers' International Journal.*

CORK EXTRACTOR.



The removal of a cork from a bottle into which it has been driven, is often a work of some difficulty. The implement shown in the annexed engraving, is designed to meet this difficulty. It is the invention of C. Rosenberry, of Chicago, Ill. It consists of a wire grapple, made of four wires twisted together to form a handle, leaving four ends projecting and hooked to seize the cork. The hooks are made to engage the cork, by a sliding ring with a wire handle which slides through the ring of the handle of the grapple. When, in taking out the cork, the grapple meets the neck of the bottle, the latter holds it firmly to its work.

We have often, in the laboratory, felt the need of such an instrument as this, when wasting time endeavoring to ensnare a cork with a string. Corks, at such times, seem endowed with an amount of sagacity which enables them to elude a noose almost as surely as a Sixth Ward rough in New York. Had such an implement as this been within our reach, we have no doubt we should have been saved many a trial to a temper not the best adapted to withstand severe strains.

Italian Maritime Exhibition.

A grand maritime exhibition was recently inaugurated at Naples, which is described as being a very interesting and instructive display. The exhibition was divided into ten groups or subdivisions, including steam machines, models of ships, military arsenal machines, cordage, instruments for navigation, marine comestibles, fishing instruments and materials, articles illustrative of the ancient and modern marine, etc. Finally a number of objects were admitted under the class of articles of exportation, among which were some exquisite Venetian corals and glass.

The exhibition building was erected at the water's edge, and in fact extended partly over the water of the bay, which gave an opportunity for the construction of an aquarium in an ingenious manner. It was in an apartment below the level of the water; in fact, it was a little submarine grotto, with a portion of the sea itself shut in by wire walls, where the fish swam about for their own and the visitor's pleasure. Cuttlefish, starfish, lobsters, a turtle some five feet in circumference, and numerous other citizens of the blue Mediterranean, disported in their native element, quite unconscious of the admiring gaze of the crowd. Large panes of blue glass at the sides let in a strong light that reminded one of Capri, and rendered the cave a most interesting feature.

© 1871 SCIENTIFIC AMERICAN, INC.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.
☞ "The New York News Co.," 8 Spruce street, New York.
☞ Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL XXIV., NO. 23 . . . [NEW SERIES.] *Twenty-sixth Year.*

NEW YORK, SATURDAY, JUNE 3, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

Adhesive Leather Belts.....355
Aeronantic Machine.....352
A few Corrections in the Method of Determining the Percentage of Water in Steam.....357
A Gas Well at Buffalo.....352
*A New Spectroscope.....355
A Night on Vesuvius during an Eruption.....351
Answers to Correspondents.....362
*Apparatus for Dyeing Hair.....355
Applications for the Extension of Patents.....362
A Single Rail Tramway.....353
Asphalting Garden Walks and Street Pavements.....353
Boxwood.....358
Business and Personal.....362
Canals, Ancient and Modern.....360
Catgut.....357
Chamois Leather.....362
Charles E. Emery on Compound Engines.....359
Chinese Ornaments or Curiosities.....352
Cloves.....361
*Combined Thimble and Needle Threader.....355
*Cork Extractor.....358
Economizing Fuel and Preventing Ing Smoke.....358
Electricity as a Motive Power.....358
Fallacies in Building.....356
Galvanized Water Pipes.....356
How do you prove your Plumb Rule?.....356
How Labor Enslaves Itself to Capital.....359
How Palm-leaf Hats are made.....353
How to Preserve Fats.....355
*Improved Furnace Grate.....358
Influence of Female Magnetism on the Compass.....352
Increasing the Hight of Rooms.....352
Inventions Patented in England by Americans.....363
Italian Maritime Exhibition.....358
Jean Lafitte and his Treasure.....360
Kalsomining.....351
*Machine for Labeling Fruit and other Cans.....351
Note on Caseine and Milk-ash.....361
Ocean Telegraphy.....360
Official List of Patents.....363
Oil Well Torpedoes.....353
Painting Iron Work.....361
Plague in Buenos Ayres.....357
Poison of the Cobra.....355
Popularizing Science.....360
Proportion of Sliding Surfaces.....356
Queries.....363
Ransome's Artificial Stone.....352
Recent American and Foreign Patents.....363
Reply to a few Corrections, etc.....357
Rice's Process for obtaining Gelatine from Bones, Horn Pith, etc.355
*Rock Tunneling Machine.....354
*Sash Lock.....358
Scientific Intelligence.....361
Steam Hygrometer.....356
The Descent of Man.....363
The Erie Canal Navigation Problem.....359
The First Telegraphic Instrument.355
The Hartford Steam Boiler and Inspection Company.....362
The Movable Stone.....352
The Strains on Ships at Sea.....353
The Wealth in our Western Veins.353
Things Worth Knowing.....357
Trial of Olmstead's Electric Car Brake.....360
Underground Explorations.....353
Zinc Water Tanks.....361

Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the venders of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of from 25,000 to 30,000 copies per week larger than any other paper of its class in the world, and nearly as large as the combined circulation of all the other papers of its kind published.

THE ERIE CANAL NAVIGATION PROBLEM.

In the present article, we propose to notice some of the plans and devices that have been patented in this country for the propulsion of canal boats. In doing this, we shall not, perhaps, enter into a detailed description of any, but will give, in as few words as possible, the general principle of operation of such as may be suggestive in their character, or the defects of which may be either shunned or remedied by inventors.

One of the first we find recorded, is an Archimedes screw surrounded by a casing, which was intended to protect the propeller and insure a more perfect action by reducing the slip. What was expected to be gained through the use of an Archimedes screw, that could not be obtained by the use of a flat screwblade, the record does not set forth.

Next, we find paddle wheels set in shafts placed parallel to the line of motion of the boat, having blades or paddles placed obliquely to the axis of the wheel. It is obvious that wheels of this kind might be made to propel a boat. When moving in one direction, their tendency would be to throw the water toward the sides of the boat. Moving in the opposite direction, they must cause a powerful swell against the banks, if moved with even moderate velocity.

We also find a screw propeller having grooved or ribbed blades, undoubtedly intended to obviate slip. It is not surprising that in the earlier attempts to use screws for this purpose, such devices should have been tried, since at that time very little of the philosophy of screw propulsion was known.

A propeller consisting of two hinged buckets, connected by rods to a horizontal oscillating beam, which caused the buckets to move back and forth, like the feet of a man in the act of swimming, is also one of the earlier devices A screw wheel, hung in the rudder, and having a miter wheel at the end of its shaft next the boat, receiving power from a vertical shaft, which was driven by miter gearing from a horizontal crank shaft, is another of the earlier devices. Of course, the connection of the propeller shaft by miter gearing enabled it to be swung about with the rudder, and it was evidently sought by this means to aid the rudder in changing the direction of the boat, since the action of the propeller would always be in the central vertical plane of the rudder. The screw was placed at the outer edge, and near the lower part of the rudder blade, and its shaft passed through the blade at right angles with the rudder post, being sustained by suitable bearings or boxes.

We find, also, a pump with changeable valves, which drew in water at the bow of the boat and discharged it at the stern. The changeable valves permited the water to be drawn in at the stern and discharged at the bow, in order to reverse the motion of the boat.

A screw, with a portion of the blade made elastic, is also one of the patented devices, the object of which is not very apparent.

Placing a steamboat at the stern of a boat and pushing it along, is also one of those devices of which we seek in vain some intelligible purpose.

A queer device is that of an oscillating propeller, placed one on each side of the stern of the boat; the propeller being a flat blade, propelled by a pivoted lever.

Another curious idea is that of placing a screw at the stern of the boat, to work in water, and another at the bow to work in air. The latter was intended to aid in raising the bow out of the water, though how it could do so, or what good there would be in so doing, could it have been done, probably was apparent only to its inventor.

A screw with a cylinder cast or formed upon the ends of the blades, and revolving with it, is an attempt to carry out in another form the snpposed obviation of slip, which preceding inventors had sought to gain by fixed cylinders.

A boat, constructed with two water channels, extending one on each side of the whole length of the boat, with paddle wheels in the middle of the channels, is another attempt which has in it some elements of value. At least, the inventor evidently comprehended the fact, that the displacement must be made toward the rear of the boat, in order to avoid side swells.

The next device worthy of notice is a boat with a central channel and a single paddle wheel. This boat was, essentially, made with two hulls, though above the water line they were decked in common. The exterior lines were straight, the general plan being such as would be described by splitting an ordinary hull lengthwise, and placing the outsides inward, so as to leave a channel between.

Later, we find a series of vertically adjustable paddles, working in a reciprocating frame.

Then follows a pole propeller, or what might be appropriately styled crab feet, which, engaging the bottom, push the boat along.

Subsequently, a toothed rack, to run the entire distance along the side of the canal, was invented and proposed, the power to be applied from a toothed wheel, attached to the boat. The same idea has been, more recently, modified by another inventor, who proposed a chain instead of the rack, the teeth of the wheel to engage the links of the chain.

Further along, we meet with an endless chain propeller, with paddles, like the buckets now used in chain pumps. Also, a reciprocating propeller, somewhat on the principle of a duck's foot.

Then we fall upon reciprocating rods, with adjustable floats, and another reciprocating duck's foot propeller, and a frame working oscillating paddles at the side of the boat.

It will be seen that in this, as in other departments of invention, the earlier ideas were many of them crude and impracticable, but the history of the application of steam power to the propulsion of canal boats, from the first attempt down to the one which will at last prove successful, will be scarcely less interesting than that of the various modes of propulsion for larger craft upon rivers, lakes, and oceans. In a future article, we may give some further information in regard to later inventions of this kind.

HOW LABOR ENSLAVES ITSELF TO CAPITAL.

If, in speaking plain truths, we hit somebody hard, our duties as public journalists admonish us to "cry aloud and spare not." The recent coal strikes, with their attendant riot and bloodshed, are an effort on the part of the working miners to shake off chains which they themselves have helped to rivet.

The right of working men to form associations to protect their own interests is conceded. So long as any class is conceded this right, working men must be allowed the same right. Availing themselves of this right, their trade associations have become numerous, and, in one way, powerful. In compelling their fellows to obey the dictates of their associations, whether members or not, they succeed sometimes, by adopting the most ruffianly and dastardly means. The latter remark, however, applies with greater force to the European trade associations than to the American. Blowing up workmen with powder, putting needles in clay, rattening, etc., have not to any great extent disgraced the cause of labor in this country, principally because the superior education of American workmen has produced a civilization which revolts at such outrages.

In the struggle between capital and labor, which bids fair to be a long and bitter one before a final adjustment of their mutual relations shall be reached, the working men possess three essential elements of weakness. The first is, in supposing brute force to be stronger than mental and moral force. The second is that their want of frugality disqualifies them for holding out in long strikes, when starvation takes sides with capital. The third is, that, by excluding apprentices, they act like a general who, advancing to meet a powerful foe, refuses to accept recruits.

If they opened their ranks to all new comers, and, by intelligent leadership, were directed to expend their efforts in creating opinion, and were caused to act as an unit, they could do almost anything they wished. By keeping at work and living providently, they could use their money to better advantage than by contributing to the support of isolated bands of strikers, at war with individual capitalists.

At present the trade unions coöperate in only a feeble manner, and only for temporary results. Their leaders often use them to further their own political, or other selfish interests; and so long as the mere control of present wages, and restriction of other working men from entering the trades, are the objects of these organizations, they may and must be so used by their leaders. They have no grand principle for which they struggle; no definite idea of a final adjustment between capital and labor; nothing that looks forward to a time when the interests of both shall be recognized as mutual. Hence they are divided by dissensions, and led by demagogues. Capital, guided by intelligence, is stronger than they in all except brute force. At any time it retreats, it conquers, while retreat with a trade union, as at present organized, is disastrous defeat.

CHARLES E. EMERY ON COMPOUND ENGINES.

A given measure of expansion of a given volume of steam will develop a constant measure of mechanical power. Upon this axiom have those based their arguments, who maintain that compound engines have no capacity which theoretically can account for any economy of the fuel required for the performance of a given amount of work.

With this axiom Mr. Charles E. Emery takes no issue; but, in a paper recently read before the Society of Practical Engineering, he announces a new theory, which, while it does not conflict with the fundamental axiom enunciated, does, he claims, account theoretically for a larger gain in economy made, or which it is possible to make, through the compound system.

That for marine engines "it furnishes a better working engine mechanically, for utilizing the benefit of the expansion of high pressure steam, will," he thinks, "be very generally conceded;" but, he claims that "independently of mechanical considerations, it is more economical to use steam expansively, in a compound engine, than in any form of the ordinary engine."

While admitting that there is no power gained through the use of a small high pressure cylinder, in combination with a large low pressure cylinder, and that, in so far as it is asserted that there must be loss of power owing to multiplication of passages, increase of clearance, etc., the engineers who deny the essential value of the compound system are right, he asserts that they err in considering the capacity of the cylinder as the measure of the steam used. This fact, he asserts, has been proved over and over, but has not till now received much attention.

As additional proof, however, he cites some experiments of his own, made with two cylinders of like dimensions, the one of glass and the other of iron, the iron cylinder using fully twice as much steam as the glass one. The details of the experiments given by Mr. Emery leave no doubt that the difference in condensing power between the two cylinders actually existed, as would also be supposed by those conversant with the difference in conducting and radiating powers possessed by the materials named.

Mr. Emery does not state, however, whether one cylinder performed more work than the other, and we are left in the dark on this point. The amount of steam used in the two cylinders was determined by condensation, and we have no doubt that had it also been measured by the work performed, under circumstances calculated to economize the power of the steam to its utmost practical limit, the iron cylinder would have done nearly as much work as the glass one, with the same volume and pressure of steam, the difference being only that due to external surface radiation.

He states that the experiments referred to suggested the employment of cylinders of non-conducting materials, when it occurred to him that nearly the same result might be obtained through properly constructed compound engines, involving no difficult mechanical details.

The material part of the loss he regards as arising from the transfer of heat, by radiation, from the cylinder to the exhausting steam. Connecting this fact with the fact that "the quantity of heat transferred from a radiating body to an absorbing body varies as the square of the difference of temperatures," he argues that if the temperature of the metal surface of a steam cylinder be 280°, and that of the exhaust 150°, the employment of two cylinders, reducing the temperature in each to one half the original amount, would reduce the condensation through radiation to one fourth that of the first cylinder; or, making all due allowance for increased extent of surface, to not less than one third as much, thus making a clear gain of two thirds of the heat lost by radiation in the single cylinder.

We have endeavored to give in brief a fair statement of Mr. Emery's theory, though necessarily omitting much of his argument. It is a most plausible one, but we are not yet willing to concede that it demonstrates the superiority of the compound system. We are willing to admit—in fact, we have already shown in a previous article—that engines of this class have mechanical advantages which render them desirable for marine service.

If our readers will refer to the interesting communication of Mr. Harrison, published in our last issue, they will see that the boiler pressure of a first class steamer, having one of these engines, is fifty-four pounds, and that expansion and condensation are both employed. The usual expansion is, we believe, about twelve times, in such engines; and, in the diagram accompanying Mr. Harrison's communication, the steam is shown as being cut off at half stroke in both the cylinders. The vacuum is maintained at twenty-seven inches. The boiler pressure used with these engines rarely exceeds sixty pounds, at which the temperature of the steam is 307°. Suppose this steam to be expanded down to the atmospheric line. The difference between its temperature, when expanded, and that at sixty pounds, would be 95°. The amount of heat, then, that might be lost, by internal radiation, sup

© 1871 SCIENTIFIC AMERICAN, INC.

posing the steam to heat the cylinder at 307° at the commencement of the stroke, and to cool it down to 212° at the end of the stroke, would be 95° × .12983 (specific heat of iron) multiplied by the weight of the cylinder, piston, and that portion of the piston rod subjected to steam heat, estimated in pounds. The product would be expressed in units of heat. It is evident that such loss would be large on heavy cylinders, unless the heat was converted into work by the expansion of steam at lower temperatures. This is done in the compound engines of the Magellan, as, according to Mr. Harrison's statement, the steam performs work to within six inches of vacuum.

Now, will Mr. Emery explain what other than mechanical difficulties impede the attainment of the same result with single cylinder high pressure engines, using condensers?

As the heat leaves the cylinder, what does it do but continue to expand the contained steam, thereby enabling it to follow the piston with greater efficiency down to and below the atmospheric line, the steam exhausting at a pressure of six inches of mercury column? Is this not possible, at least theoretically, in a single cylinder, with a condenser?

The heat abstracted by the cylinder at high pressures, is stored up and imparted again at lower pressures, in both systems; and we maintain still, that, under the same conditions, the same amount of expansion will produce the same economical result. Of course, the surface radiation in compound is greater than that in single cylinders.

If Mr. Emery's theory be correct, the steam jacketing of a cylinder is bad practice; for, though the cylinder abstracts no heat from the steam, as soon as the steam expands, the cylinder imparts heat, the amount of which must be greater when the cylinder is kept at a constant temperature, than when the temperature decreases and keeps more nearly uniform with that of the steam. If the heat imparted by the hot cylinder be not converted into work, it is lost; and we admit that, if allowed to exhaust without condensation, so that expansion can be carried to its lowest practical point, there would be loss; but why this cannot be done in a single cylinder, we, in common with many others, fail to see.

POPULARIZING SCIENCE.

We have seen it stated that, during the siege of Paris, Henry St. Claire Deville, one of the most illustrious, and, at the same time, genial and popular of the scientific men of France, made an address to the members of the Academy of Sciences, which was the occasion of earnest debate; but the text of the speech had not reached us until the English periodical *Nature* gave it in the original French to its readers. Deville says, what all the world had been uttering before him, that France was conquered by the science of Germany. The very discoveries and inventions of their own men had been used to destroy them. "The discoveries of Ampère, the inventions of our military engineers, have been cruelly employed against us, and thus they say on every side, and with truth, that we have been conquered by science," are his words.

In seeking for an explanation of this disastrous state of affairs, Deville gives two adequate reasons: the first, that men of science had been overlooked by the Government, and mere politicians appointed in their places; and secondly, that the members of the Academy had devoted themselves too exclusively to abstract science, and left the world to find out what was going on in the best way it could. He proposes as a security, that the Institute should appoint committees to discuss all matters relating to the government; and, at the same time, seek to popularize science, and, by well edited publications, to familiarize the public mind with the grand discoveries of the day.

It ought not to be forgotten, in this connection, that it was Deville who obtained an appropriation of 50,000 francs from the Emperor, to make investigations into the properties and uses of aluminum. But this was a paltry sum compared with the millions expended by the same ruler on the luxuries and vanities of his court. And yet, out of the research made by Deville has grown the cheap manufacture of sodium, and, indirectly, the preparation of the rare metals aluminum, magnesium, boron, silicon, and the gold amalgamation process. He made the fifty thousand francs go a great way, and showed what might be accomplished if the patronage of the government could be extended to similar investigations in other directions. Deville was, therefore, entitled to call upon his fellow members to come out from the dry bones of abstract science, and try to clothe them with the garments of usefulness and intelligence.

It is certainly true that the French Institute has for a long time presented a curious spectacle to the world. Its members have grown old in the study of theoretical matters. They could not see beyond the ends of their noses, and when the war broke out, and they found themselves shut up in Paris, they suddenly tried to make themselves useful by attacking some of the practical questions of the day, such as proper food for famine times, and deadly weapons and explosives for their enemies.

It is amusing to read what they said about Boston brown, or Graham bread. Payen, who has written volumes, said that he had tasted it, and found it good; Dumas had seen it baked; Chevreul, the founder of all we know about soap and candles, had had some experience with it, and so on, through the list. And these grave men actually decided that "unbolted flour was safe to eat in war times." It is evidently high time that the members of the Institute were woken up, and, as an inducement for them to look more to practical matters, it would be well for the new government to assign them places in the bureaux where a scientific knowledge is requisite. What they need in France is less politics and more science. Would it not be wise for us to investigate matters in this country, to see how far our own Government is conducted by politicians, and how often scientific men are invited to take part in the various branches of administration?

France, by her own showing, has been ruined by politicians; it may be well for us to take note of this and profit by the lesson. In the matter of popularizing science, we can safely challenge criticism, in the United States. There is scarcely a newspaper, magazine, or weekly, that has not a special scientific department, and the SCIENTIFIC AMERICAN, in the course of the year, furnishes an account to its readers, of every invention of importance that is made in any part of the world.

The result of this wide dissemination of knowledge is that the American people are famous for their practical talent The universal Yankee is a mystery to European nations, as they have no analogous character with which to compare him. There is more danger of our running to the other extreme, and of our rendering scientific knowledge superficial by too great a desire for popularizing it. It is better to strike an average, and to secure well-endowed universities, as well as technological institutes; and as our journal is outside the arena of politics, we may with propriety suggest that a little less politics and more science, in the administration of the affairs of Government, would enable us to escape the dangers which have brought France so low, and threaten some day to overturn our own Government.

TRIAL OF OLMSTEAD'S ELECTRIC CAR BRAKE.

An excursion party, consisting of members of the press and railroad men, was recently invited to witness the trial and operation of this novel brake on a train of five cars on the Erie Railway.

The levers are of the ordinary kind, and may be operated by hand in the ordinary manner. The electric device is an attachment to one of the levers of the ordinary brake. The electric arrangement is as follows; A horizontal swing shaft is placed within the car truck, parallel with the car axle, on which shaft is a loose shell pulley which receives motion from the car axle against which it rests. Within the loose pulley is a fixed pulley, keyed on the swing shaft. On the face of the fixed pulley are two powerful electro magnets, each capable of sustaining 300 pounds, so that their combined force is 600 pounds; these are connected by wires with a Daniell's battery, on the car; each car having its separate battery. A chain extends from the swing shaft to the brake lever.

The wires, connecting the battery and the magnets, extend to a key board attached to the ceiling of the car, and the electric connection is made at this point by a simple lever or key, operated by the bell cord. On pulling the cord, whether by the engineer or conductor, or by the breaking of the coupling, the electric circuit is made, and the magnets draw the loose and fixed pulley together, whereupon the swing shaft winds up the brake chain, and the brakes operate on the wheels and stop the train.

It may be said that the electricity forms a clutch, and thus holds the brake shaft to a pulley which is kept in motion by the movement of the car. Electricity is therefore employed as an aid to utilize the momentum of a moving train or car.

The party started from Jersey City at 12 30 P. M., and, after passing through Bergen Tunnel, the trials were made on the level grounds of the meadows, as follows:

1st. The train was stopped in 55 seconds with hand brakes.

2nd. The electric brake stopped it in 45 seconds.

3rd. With the electric brake and reversing the engine, the train was stopped in 28 seconds.

4th. The engine was detached from the train when going at full speed, which set the electric brakes in operation throughout the train, the latter being stopped by their action in 22 seconds.

5th. This was the last trial, and consisted in detaching the two rear cars, when the train had attained a maximum speed. The moment they were detached, the electric brakes were set by the cord itself, and the two cars stopped in 13 seconds, while the part attached to the locomotive was stopped in about 40 seconds. The maximum speed in all the above trials was 30 miles per hour.

Every trial was a success, showing the great utility of the device.

The electric brake may be operated by the engineer or by the conductor, by simply pulling the bell cord. In case of separation of the train, by the running off of one of the cars or other cause, the brakes become self-acting, and their force is instantly applied.

On the conclusion of the experiments, which were eminently successful, the party returned to Jersey City, and partook of a sumptuous lunch at the Erie Depot.

We learned that this brake had been in use on the Middletown train of the Erie road, for the last seven months, stopping the train fifty times daily; and further that it was the means of saving the train from a fearful accident at West Patersou Bridge, where the engineer was warned of danger only 2,000 feet distant, and stopped the train within 50 feet of an oil train, in 23 seconds on a down grade.

The brake was patented April, 1870, by J. Olmstead and W. O. Cooke, of Providence, R. I.

OCEAN TELEGRAPHY.

Cyrus W. Field, Esq., in a recent letter to Prof. Morse, states that the date of completion of the first Atlantic cable, between Great Britain and America, was August 5, 1858. This cable ceased to work on September 1st of the same year, after exactly four hundred messages had been transmitted.

An attempt to lay another cable was made in 1865; but on the 2d of August of that year, when about two thirds of the length had been laid, the cable broke from the vessel and was lost.

The second cable, between Ireland and Newfoundland, was completed July 27, 1866.

The third cable (consisting of the lost cable of 1865, which was recovered in 1866,) was completed September 8, 1866.

The fourth cable, from France *viâ* St. Pierre, N. F., to Duxbury, Mass., was completed July 23, 1869.

During the month of March of the present year, 12,547 messages, or about 405 per day, were transmitted by Atlantic cable.

At present, only one cable—the French—is in working order. The first cable is supposed to have been defective in construction. The second and third cables ceased to work some time ago, owing to defects in the shore ends near Newfoundland. These cables are to be fished up and repaired in June next. All the business is at present done on the French cable.

Telegraph lines now reach as far east as Singapore, a distance of some nine thousand miles from New York. From Singapore to Hong Kong, a line is to be completed within a month; and from this line a cable to Australia is to be completed in November next.

JEAN LAFITTE AND HIS TREASURE.

The reputation for wealth acquired by piracy, which Jean Lafitte has attained, has set many to employ time and means, worthy of nobler ends, in searching for his hidden treasures. Lafitte was not a sailor, nor a pirate. He was a blacksmith by trade, and became agent to an association engaged in the capture of Spanish merchantmen. This association was under a commission from the Republic of Columbia, which was, in the early part of the present century, at war with Spain. Columbia issued letters of marque to the ships of Lafitte's organization, and a great deal of valuable merchandise was seized. The property was taken into possession by the United States Government, and consumed during the defence of New Orleans, in 1814 and 1815. Lafitte's men were released from the prison, in which they had been placed, and sent to man the batteries in Jackson's lines. They were granted full liberty at the end of the war, and received the thanks of General Jackson.

These facts must be in the remembrance of some now living, and are mentioned in books accessible to all the world; but there is a curious superstition among the more credulous of the inhabitants of some of the Southern States, that Lafitte and his followers buried untold mines of wealth in some of the islands outside the Rigolets. The folly of the believers in this "yarn" has led many of them to risk their fortunes in attempts to recover the treasures, and the fact that Lafitte's men, when discharged from service, never visited the place where they are reported to have deposited their property, has not prevented men, even in our own day, from following the chimera. Jean Lafitte was drowned in the Gulf, in the wreck of a little ship of which he was supercargo, and his associates mostly remained in New Orleans, and were always poor men.

Recently, Mr. A. J. Newell, a compositor by trade, and lately employed on the New Orleans *Picayune*, left his home to explore the islands which tradition pointed out as the depository of the treasures. He had received from his father an oral communication (said to be derived from one of Lafitte's men), detailing the place of deposit with minute exactness. Many members of Mr. Newell's family had made similar voyages, and their credulity was not shaken by the always-repeated failure. But a disaster has now changed the comparatively harmless folly into a tragedy. Mr. Newell's body was discovered in the water, near the islands, with the marks of a fatal gunshot on it. Thus ends a life made remarkable by its utter engrossment by one idea, spent in pursuing that idea in the teeth of common sense, reason, and history.

CANALS, ANCIENT AND MODERN.

The ancients early recognized the importance of canals as mediums for internal communication. Probably the first work of this kind was constructed by the Egyptians. It connected the Nile with the Red Sea, and in 1798 the work was in such a state of preservation that a company of French engineers reported that it only needed cleansing to render it navigable once more. Herodotus attributes its commencement to Pharoah Necos, in the year 616 B.C. Although Pliny, Strabo, and other historians do not agree with Herodotus as to the date of its commencement and the name of its founder, they all agree in that there was such a canal, and that it was commenced some five or six centuries before the Christian era. Strabo says the canal was 150 feet (100 cubits) broad, and that ships were four days in sailing through it.

The Cnidians, ancient inhabitants of Caria, in Asia Minor, designed and dug a channel through the isthmus joining their territory to the continent.

The Greeks made an unsuccessful attempt to cut a navigable passage between the Ionian Sea and the Archipelago.

The Romans built large canals, called "Fossæ Philistinæ," at the mouth of the Eridanus or Po river. The canals of the Pontine marshes were accomplished 162 B. C., and, after a long period of disuse, were restored by the Emperor Trajan.

From time immemorial, the rivers of China have been united by canals, and there is no country on the face of the globe where the advantages of such a network of canals are so manifest; for these canals, with the natural water communications, render the tunnage of that country but a little less than the combined tunnage of the rest of the world. The Grand Canal of China is the most stupendous work of the

© 1871 SCIENTIFIC AMERICAN, INC.

kind ever executed. It was commenced in the tenth century of our era. It is nearly 700 miles in length, and extends from Hang-choo-foo to Yan-liang river, forming an unbroken connection between fifty cities. It joins the great rivers Yang-tse-kiang, 2,900 miles long, and Ho-hang-ho, 2,000 miles. This and other Chinese canals are not constructed upon the same plan as the canals of Europe and America, nor composed like them of standing water, fed by reservoirs, elevated and lowered by means of locks. The want of locks obliges the Chinese to conduct their canals around the different elevations encountered, and to lift the boats by means of chain and capstan. The irrigation supplied by the Grand Canal renders the country through which it passes exceedingly fertile, and, in proportion to its size, the most populous spot in the world.

The construction of canals in modern Europe was commenced in the twelfth century. Sluices, with double doors, were not introduced until 1481. They were first used at Viterbo, in Italy.

The first canal made in England connected the rivers Trent and Witham. It was begun during the reign of Henry I. England has now 2,800 miles of canal communication, Ireland 300, and Scotland 175; making a total of 3,275 miles for the United Kingdom. The longest of these canals is that which joins Leeds and Liverpool, 127 miles in length, finished in 1816. The New river, which has supplied London with water, is a canal. The canal connecting Manchester with Worsley, built by the Duke of Bridgewater, in 1755, was cut, for eighteen miles, under ground, at a cost of £170,000.

The canal of Briare, the oldest in France, was commenced in the year 1606, during the reign of Henri Quatre, and finished in 1740. It is 34½ miles long, and in conjunction with the canal of Loing, at Montargis, forms a communication between the rivers Loire and Seine. It was constructed under Hugues Cromier, a renowned engineer of that time. The celebrated canal of Languedoc is the largest in France. It has more than one hundred locks, is 153 miles in length, and is capable of admitting vessels of one hundred tuns burthen. Commencing in the river Garonne, at Toulouse, and terminating in the lake of Thau, it forms a connection between the Atlantic and Mediterranean seas. The canal from the Durance to Marseilles is 52 miles long; 11 miles of this length are subterranean passages through the Alps. It was finished July 8, 1847.

Holland, the land of dikes and ditches, is completely cut up into small islands by its extensive system of canals, which cross and interlace each other like the threads of some large fishing net. Owing to the level state of the country, the construction of a canal involves but comparatively little labor and expense, and many of them are used as substitutes for public highways; in the winter, their frozen surfaces offer convenient roads for skaters. The North Holland canal, the finest work of its kind in Europe, was built during the years 1819–23, at a cost of $4,750,000. It is 50 miles long, 125 feet broad at the surface, 36 feet at the bottom, and has an average depth of 21 feet. By means of this canal, ships bound to Amsterdam avoid the danger and delay incurred in navigating the Zuyder Zee. Since not only the surface, but the bed of many of these canals is above the level of the land, the drainage of the meadow lands, through which they run, is a matter of great solicitude. It is effected by means of wind mills, working pumps.

In spite of many difficulties, Russia is traversed by canals. An unbroken communication, by this means, has been established between St. Petersburg and the Caspian Sea; canals unite the Baltic and Black Seas; and the White and the Caspian are in like manner united. A traveler can go from St. Petersburg to Selmquisk, in Siberia, with the exception of a few miles, all the way by water.

In 1817, Mehemet Ali, perceiving the importance of Alexandria as a commercial center, restored the ancient communication with the Nile by means of the Mahmoudieh Canal. Since the building of this canal, the population of Alexandria has quadrupled. About a half a century after the completion of the Mahmoudieh Canal, the great canal of Suez was opened to the commerce of the world.

The first canals constructed in the United States were those of South Hadley and Montague, in the State of Massachusetts. The company received its charter in 1792, and the work was commenced without delay. The South Hadley canal was built to afford a safe transit around the South Hadley Falls. It is two miles long, has five locks, and for a distance of 300 feet is cut 40 feet deep through solid clay-slate rock. The Montague canal passes around Turner's Falls, is three miles long, and has 75 feet of lockage.

The largest canals of the United States are:

NAME.	STATE.	LENGTH.	COST.
Erie	New York.	363	$ 8,401,391
Chesapeake & Ohio	Maryland.	191	10,00 ,000
Central Division	Pennsylvania.	173	5,30 ,252
Western "	"	104	3,006,522
Delaware & Hudson	New York and Pennsylvania.	108	9,000,000
Ohio & Erie	Ohio.	307	4,695,824
Miami	"	278	3,750,000
Illinois & Michigan	Illinois.	102	8,654,337

The Welland Canal, in Canada, which connects the Lakes Erie and Ontario, avoiding Niagara Falls, is but 36 miles in length, yet it cost the enormous sum of $7,000,000.

With the invention of the locomotive engine, and its subsequent introduction, the time of the construction of large and expensive canals passed away. While the increase in the total length of the canals of the United States, during the past twenty years, can be not more than a thousand miles, the increase in the total length of railways, during the same period, is more than forty thousand. An additional barrier to an extensive increase of canal communication, looms up in the shape of narrow gage railways, which are attracting great attention at this time, and which at no distant day will be the great freight carrying methods of this country.

THE DESCENT OF MAN.

A CONTINUATION OF AN OLD SONG.

Air—"Greensleeves." (*Darwin loquitur.*)

"Man comes from a mammal that lived up a tree,
And a great coat of hair on his outside had he,
Very much like the dreadnoughts we frequently see—
Which nobody can deny.

He had points to his ears, and a tail to his rump,
To assist him with ease through the branches to jump—
In some cases quite long, and in some a mere stump—
Which nobody can deny.

This mammal, abstaining from mischievous pranks,
Was thought worthy in time to be raised from the ranks,
And with some small ado came to stand on two shanks—
Which nobody can deny.

Thus planted, his course he so prudently steered,
That his hand soon improved and his intellect cleared;
Then his forehead enlarged and his tail disappeared—
Which nobody can deny.

"'Tisn't easy to settle *when* Man became Man;
When the Monkey type stopped and the Human began;
But some very queer things were involved in the plan—
Which nobody can deny.

"Women plainly had beards and big whiskers at first;
While the man supplied milk when the baby was nursed;
And some other strong facts I could tell—if I durst—
Which nobody can deny.

"Our arboreal sire had a pedigree too;
The Marsupial system comes here into view;
So we'll trace him, I think, to a Great Kangaroo—
Which nobody can deny.

"The Kangaroo's parent, perhaps, was a bird;
But an Ornithorhynchus would not be absurd;
Then to frogs and strange fishes we back are referred—
Which nobody can deny."

Thus far Darwin has said: But the root of the Tree,
Its nature, its name, and what caused it to be,
Seem a secret to him, just as much as to me,
Which nobody can deny.

Did it always exist as a great institution?
And *what* made it start on its first evolution?
As to this our good friend offers no contribution—
Which nobody can deny.

Yet I think that if Darwin would make a clean breast,
Some botanical views would be frankly confessed,
And that all flesh is grass would stand boldly expressed—
Which nobody can deny.

—*Blackwood.*

SCIENTIFIC INTELLIGENCE.

HYDRATE OF CHLORAL AS A REDUCING AGENT.

It is stated in some of the pharmaceutical journals that the hydrate of chloral can be employed as a reducing agent to great advantage. All of the noble metals are at once reduced by it, in the presence of caustic potash or soda; and as chloroform is evolved in the process, and this envelopes the reduced powder, the precipitate can be readily washed out. When the solutions of gold, or of the metals of the platinum group, are treated with hydrate of chloral, warmed, and an excess of caustic soda added, and the whole boiled for a minute, a complete reduction of the metals takes place, probably in consequence of the formation of some formic acid by the splitting up of the chloroform. In the case of silver salts, the reduction is also complete, and chloride of silver is formed. Mercury salts are not acted upon. Those properties of the hydrate of chloral suggest its possible application for metal plating on glass, and possibly in photography. Let some one try the experiment, and report the results.

HYDROSTATIC-GALVANIC GAS LIGHTER.

A number of patents have been taken out for the instantaneous ignition of gas by electricity, but they all require the laying down of long connecting wires, and more or less complicated apparatus. Professor Klinkerfues, of the University of Göttingen, has invented for his use, in the astronomical Observatory, of which he is Director, a simple apparatus, which may be capable of more extended application than the learned professor contemplated when he had it constructed. It was in this same observatory that the famous Gauss had an electromagnetic telegraph in operation ten years before one was setup in the United States, but in those days there was little enterprise among the scientific journals, and so the world lost the benefit of the invention. We therefore hasten to relate what Professor Klinkerfues has done to avoid a repetition of the former error; but we are unable to give the drawings, as they have not yet reached us. The hydrostatic-galvanic gas lighter consists of a simple apparatus, attached to each street lamp or gas jet, and communicating with the supply pipe in such a way that by increasing or diminishing the pressure, it is immediately brought into or thrown out of action. Keeping the apparatus in order would be the work of the lamp cleaner, and would not require any particular skill. It is well known that a jet of steam, through wire gauze or pointed teeth, will evolve electricity, and it is probable that the same principle is applied to a jet of gas. The experiments tried in Göttingen are said to have been entirely successful.

TECHNICAL USES OF CARBOLIC ACID.

Emil Sommer gives, in a German industrial paper, a summary of the more recent technical applications of carbolic acid, from which we translate the following:

1. In tanning. The fresh hides are kept fresh and from putrefaction by employing a weak solution of carbolic acid, instead of salt, as formerly; and further, to avoid considerable loss in the liming process, in the preparation of the lime a solution of carbolic acid (1 in 300) is employed. It would be well to cover any animal refuse about tanneries with weak carbolic acid, to destroy the bad gases and fetid odor arising from this source.

2. Catgut manufacture. In this industry, the chief evil arises from the necessity of macerating the entrails, which renders the neighborhood unendurable. By soaking the parts in a weak solution of carbolic acid (1 in 1,000) for an hour, then hanging up to partially dry, and repeating the operation, the entrails will have lost their disagreeable odor, and can be macerated and further worked up without inconvenience.

3. Glue. The crude material for this industry can also be treated as above described.

As carbolic acid is explosive, coal-tar water can be employed as a substitute. Shake up a quantity of coal tar in water, and allow it to settle, and use the decanted water. In this way, one pound of coal tar will yield fifty quarts of weak carbolic acid.

A CARD FROM PROFESSOR LIEBIG.

Professor Liebig publishes a card in the last number of Erdmann's *Journal*, in which he stontly protests against the use of his name in connection with all manner of patent medicines, extract of malt, and the like. He says: "The only preparation which bears my name with my permission is the extract of meat mannfactured at Fray-Bentos, in South America, and this is accompanied by the condition that none of the extract shall be put into the market until it has been thoroughly tested by Professor Pettenkoffer or myself; this condition has hitherto been conscientiously observed by the Fray Bentos Company." As the extract of meat is sent to market, from all parts of the world, bearing Liebig's name, it may be well to observe that none is genuine excepting that from the above-mentioned authorized South American company.

Painting Iron Work.

There is no production for iron work so efficacious as well boiled linseed oil, properly laid on. The iron should he first well cleaned and freed from all rust and dirt; the oil should be of the best quality, and well boiled, without litharge or any dryer being added. Their on should be painted over with this, but the oil must be laid on as bare as possible, and on this fact depends in a great measure the success of the application, for if there be too thick a coat of oil put upon the work, it will skin over, be liable to blister, and scarcely ever get hard; but if iron be painted with three coats of oil, and only so much put on each coat as can be made to cover it by hard brushing, we will guarantee that the same will preserve the iron from the atmosphere for a much longer time than any other process of painting. If a dark coloring matter be necessary, we prefer burnt umber to any other pigment as a stain; it is a good hard dryer, and has many other good properties, and mixes well with the oil without injuring it.

Note on Caseine and Milk-ash.

In chemical text books the caseine is generally said to be held in solution in milk by means of an alkali, with which it is supposed to form a kind of salt; and the precipitation of caseine by means of an acid is explained as a consequence of the decomposition of the compound between caseine and the alkali, milk-ash being described as containing abundance of alkaline carbonates. The editor of the *Milk Journal*, in examining samples of milk-ash, obtained in the course of an inquiry into London milk, was struck with the fact that there is no effervescence when an acid is poured on a milk-ash This led to careful experiments on the action of a very dilute "standard acid" on the ash, and he found that there is no appreciable quantity of alkali or alkaline carbonate. According to his observations, made on a great variety of milks the milk ash does not contain so much alkaline carbonate as would amount to the $\frac{1}{100}$ of its weight. Therefore the current theory, that caseine was rendered soluble in milk by means of an alkali, cannot be true.

Zinc Water Tanks.

The *Lyon Medical* contains an article, by M. Zinrek, who has examiued water which had long been kept in such tanks He has found that the water dissolves so much the more zinc as it contains more chlorides, such, for example, as the chloride of sodium. The water also takes up larger quantities of zinc in proportion to the length of contact. Boiling does not, however, precipitate the zinc from water charged with the metal. A sample of the former was tried, in which the chlorides were in small proportion, but which had been a long time in a zinc tank. As much as fifteen grains of zinc was found in each quart. To prevent this state of things the author advises the zinc tanks to be coated inside with an oil paint, the bases of the paint being ocher or asphalt. No minium, cernse, or carbonate of zinc should, however, be used. Fifteen grains in a quart seem an enormous proportion, nor does the author say whether he found the actual metal or a salt of oxide of zinc. Better than painting it, is to discard its use for this purpose altogether.

CLOVES are the dried unexpanded flower buds of the clove tree, a celebrated spice cultivated on the island of Amhoyna in Sumatra, Zanzihar, Bourbon, and Cayenne; the culture and trade in this article was a monopoly in the hands of the Dutch for many years. The imports into the United States are about 200,000 pounds annually; and into England about 1,000,000. The name is derived from the resemblance of the spice to small nails, and in all countries it is called by a name having this signification.

© 1871 SCIENTIFIC AMERICAN, INC.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of May, 1871:

During the month, there were 644 visits of inspection made, and 1,201 boilers examined—1,064 externally and 321 internally, while there were 120 tested by hydraulic pressure. The number of defects discovered by these examinations is large, being 438, of which 70 were regarded as dangerous. No one can tell what may have been the result, had they remained neglected for a longer period. It is always best to repair defects of any kind in season, and by so doing prevent what otherwise may lead to serious difficulty. These defects in detail were as follows:

Furnaces out of shape, 17—1 dangerous; fractures, in all, 22—9 dangerous; burned plates, 24—4 dangerous; blistered plates, 64—6 dangerous; cases of sediment and deposit, 75—3 dangerous; cases of incrustation and scale, 63—3 dangerous; cases of external corrosion, 19—2 dangerous; cases of internal corrosion, 21—1 dangerous; cases of internal grooving, 3; water gages out of order, 20—3 dangerous; blow-out apparatus out of order, 9—4 dangerous; safety valves overloaded, 13—1 dangerous; safety valves stuck fast in their seats and inoperative, 5—all dangerous; pressure gages out of order, 9—4 dangerous, varying from —17 to +8; cases of deficiency of water, 2—both dangerous; broken braces and stays, 10—4 dangerous; boilers condemned, 4—all dangerous.

During the month there were 4 serious boiler explosions, by which 12 persons were killed and 4 wounded. In two of these cases the boilers were under government inspection. What condition the inspectors found them in, we have no means of knowing, but we must believe that the examinations were very inefficiently made, or that the boilers were under the management of careless and ignorant men.

CHAMOIS, or shammy leather, is leather made from various kinds of skins dressed with fish-oil, which is hammered or beaten into the pores of the skin. The leather, partially dried and washed in alkali, becomes soft and pliable. The true shammy leather, which, however, is very rare, is made from the skin of the chamois, a species of the antelope tribe of animals, which inhabits the Alpine mountains.

Advertising Agencies.

"It is a fact that all those persons doing a business which requires extensive advertising, and who from the mode of conducting it are able to arrive at a close approximation of the results produced by each separate investment in this way, are universal in the opinion that better contracts can be secured through a well-established advertising agency, like that of Geo. P. Rowell & Co., New York, than can be obtained from publishers direct, no matter how familiar with rates and papers the advertiser may be. It stands to reason that an agency controling patronage to the extent of from fifty to one hundred thousand dollars per month should be able to secure favors which would not be accorded to any mere individual, even if we omit entirely the benefits which they must derive from their extensive experience."—*Exchange.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $1 00 a Year. Advertisements 17c. a line.

For the best, purest, and most economical Machinery Oils, of all kinds, send to Oil House of Chard & Howe, 131 Maiden Lane, N. Y.

Gang Lathe.—See advertisement on last page.

A Patent for sale.—A good investment for a firm or person with capital to manufacture it. Patterns complete. Address, for full description, Lock Box 356, Lockport, N. Y.

Patent Agency.—Persons having Patents, or small Patented Articles, to sell, will do well to write or call on J. N. Bebout, Oberlin, Ohio.

Manufacturers of Fire Engines (hand or steam) and Hose, please send circulars, with prices, etc., to J. P. Hale, Mayor, Charleston, Kanawha C. H., West Va.

To Watch Repairers.—Compound for tempering pivot drills, warranted to make a drill ten times as strong, with the required hardness, as an ordinary drill. Price $2.00 per package, with instructions for use. James H. Flynt, South Bend, Ind.

Globe Turbine Water Wheel, 7¼ inch diameter, under 16 feet head, 12x12-100horse power. Andrew J. Payne, inventor, Unionville, Conn.

Engine Lathe wanted, about 30 inch swing, 12 feet bed, in good order. Pratt & Co., 87 Chambers st., and Buffalo, N. Y.

Stockholders learn what their companies are doing by reading the RAILROAD GAZETTE.

Mitchell's Grindstone Depot—310 York ave., Philadelphia.

Glass Cutters' Wheels. J. E. Mitchell, Philadelphia.

Bead Grindstones for Nailers. Mitchell, Philadelphia.

Cancer cured by a process almost painless in its operation. No knife, arsenic, or black plaster used. Send for address of parties cured to Dr. Carpenter, Newark, N. J.

Oak Tanned Leather Belting and Manufacturers' supplies. Greene, Tweed & Co., 18 Park Place.

Blake's Patent Belt Studs, the best and cheapest fastening for Leather or Rubber Belts. 10,000 manufacturers use them. Greene, Tweed & Co., 18 Park Place.

"American Manufacturer's Review," Pittsburgh, goes over the whole country. Subscription, $1. Advertisements, 15c. per line. Try it 1 year.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

The Philadelphia Scientific Mechanics' Circle will answer any mechanical question for 25 cts. Address as above, 125 N. 7th st., Philadelphia.

Electrical Instruments, Models, etc., made to order, and Gear Wheels and Pinions cut, by W. Hockhausen, 113 Nassau st., Room 10, N. Y.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Wanted.—A reliable party to manufacture a *specialty* in the House Furnishing line, either on royalty or become sole proprietor for the United States. Address J. H. Beardsley, 119 Nassau st., New York.

Experimental Machinery and Models, all sizes of Turned Shafting, Paper Box, Paper Collar, and Bosom Plaiting Machines, Self-operating Spinning Jack Attachments. W. H. Tolhurst, Machine Shop, Troy, N. Y.

Best Scales.—Fair Prices. Jones, Binghamton, N. Y.

Steam Watch Case Manufactory, J. C. Dueber, Cincinnati, Ohio. Every style of case on hand, and made to special order.

Agents Wanted—on a new plan—to sell a patent Collar Stud. Send for Circular. S. E. Williams, Hartford, Conn.

L. & J. W. Feuchtwanger, Chemists, 55 Cedar st., New York, manufacturers of Silicates of Soda and Potash, and Soluble Glass.

For Hydraulic Jacks, Punches, or Presses, write for circular to E. Lyon, 470 Grand st., New York.

Wanted.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "The Tanite Co.," Stroudsburg, Pa.

The new Stem Winding (and Stem Setting) Movements of E. Howard & Co., Boston, are acknowledged to be, in all respects, the most desirable Stem Winding Watch yet offered, either of European or American manufacture. Office, 15 Maiden Lane, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send or circular. E. H. Ashcroft, Boston, Mass.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 35 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Tin Presses & Hardware Drills. Ferracute Works, Bridgton, N. J.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by ironcable. W. D. Andrews & Bro, 111 Water st., N. Y.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

A. G. Bissell & Co. manufacture packing boxes in shooks at East Saginaw, Mich.

Twelve-horse Engine and Boiler, Paint Grinding Machinery Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 1221 Plymouth st., Brooklyn, N. Y. Send for catalogue

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 61 Nassau st., New York.

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

Read J. H. Beardsley's card in this column; it is worth looking after.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

CHEAP BATTERY.—I would answer F. R. S. that the cheap battery described by me March 11, 1871, is rightly described by him, and will work if connections be properly made. I have just set one up for a physician to run a medical apparatus, and it works to a charm. I have hundreds of electrotypes made by such battery. Let F. R. S. immerse both poles in solution of sulphate of copper, and see if one will not be dissolved and the other increased. Of course it will not make an electric light to knock down an ox or run a saw mill, but it will do any ordinary copper electrotyping, or work any small magnetic apparatus.—A. G., of Wis.

MENDING BROKEN CASTINGS.—If the castings J. G. G. wishes to make from a broken one as pattern, requires to be in all respects exactly like it, that is, if plating the broken one together (for pattern) would spoil the shape of the new one, and cementing would make it too large, I would suggest that it might, with careful drilling, be put together with small and short doweling pins.—J. G. H., of Pa.

F. S., of Conn.—The amount of sulphuric acid and chalk necessary to produce 10 cubic feet of carbonic acid would be 19 ounces, avoirdupois, of the acid, and 43 ounces of chalk.

GEAR CUTTING ON FOOT LATHE.—The answer of C. H. J. to B. B. L., of Md., gives a very crude way of cutting gear with a foot lathe. I have tried the same plan; but with a revolving cutter, we can cut ten teeth or more, to one that can be cut with a chisel or shaping tool. The plan that I use (but I make no claim to it) is as follows: In the first place we suppose that the lathe has a slide rest, that can be put to any angle, for cutting bevel or miter wheels. I have my lathe back to the wall, but it can be placed in any position, by putting two stems or posts up from the frame or from the wall. I place one over the back edge of the fly wheel, with a pulley running vertically, parallel with the lathe frame. On the other post, at the right hand side, I place a pulley running horizontally. In the T rest, I put a post with a pulley on the top, running horizontally. This is used both as a quick and a tightening pulley. I place another pulley over the front of the fly wheel, running vertically, and parallel with the frame of the lathe. All those pulleys are only to give horizontal motion to the lathe hand, from the fly wheel, so as to turn the shaft which carries the cutters vertically, the frame for which is fixed in the tool post of the slide rest. There may appear to be more pulleys than are necessary, and I have tried to do with less, but find this way the best. I put all the pulleys about 2½ inches above the line of center of lathe. A blacksmith can make a frame to hold the cutter shaft, out of iron ½ by ¾ inches, and 10½ inches long, bent at each end at right angles, 2½ inches from the ends, so as to leave about 5½ inches between the ends to carry the cutter. I drill holes through each end for a screw center with jamb nuts, so that the shaft with the cutter can revolve. I put the pulley on the shaft where it is most convenient. For the slide rest I weld a piece of iron to the frame to hold the cutter frame in the tool post. The cutters have to be made to suit the wheel to be cut. I get a dial plate, and place it on the pulley mandrel of the lathe—almost any watch maker will show how that is arranged. Any kind of gear wheel can be cut by this arrangement, whether spur, crown, or bevel (from 2 to 1, to 10 to 1), worm or spiral. The wheel to be cut is fixed on the lathe, on the plate or between the centers; the only difference in any wheel is in the way of feeding the slide rest. Inside gear can be cut by making the cutter frame small enough to pass right inside the wheel to be cut, and putting another pulley on the back of the slide rest, to carry the band out again. I know these will all work, as I have cut inside wheels, from 9 inches inside to 2 inches, without having to touch them with a file.—W. H. B., of Ill.

CHEAP BATTERY.—Notwithstanding that F. R. S. has not succeeded in making his flower pot battery and salt solution work, such an arrangement forms, for some purposes, a good and efficient battery. It is simply a Daniell's battery. By using salt and water, it makes a little less powerful battery than it would were sulphuric acid (say 24 parts to 1 of water) used. I would recommend F. R. S. to subject his copper plate to a dull red heat, and while hot, plunge it in water, to remove the oxide from its surface. The connecting rod should be soldered to the copper plate, and his zinc plate should be bright and clean. Let it be dipped into hot soda or potash solution to remove grease, and then into a weak solution of sulphuric acid (say 1 part acid to 50 parts water) for about one minute. This will remove all oxide from its surface. If he will amalgamate the zinc with mercury, the battery will work all the better. This arrangement will give very fine deposits of copper or silver, but it is too weak for gold, as it will give a pale yellow color. For electromagnetic purposes, 1 part of sulphuric acid to from 12 to 24 parts water will work well. In a short time, however, the zinc will become of a dirty drab color, in consequence of a deposition of copper on its surface. A very small portion of sulphate of copper passes through the porous cell; the zinc plate deprives the copper of its oxygen; and the copper, as a consequence, is deposited on the zinc. Keep to it, F. R. S., as I have done, and you will succeed.—T. T., of D. C.

CHEAP BATTERY.—Observing in your issue of May 20th, the remarks of "D. B., of N. Y.," in reply to "F. R. S. and friends," in regard to the construction of a cheap battery, I desire to submit the following as my experience: I constructed a battery according to the formula laid down by "A. G.," that is, according to my conception of his instructions. I placed the zinc in a solution of ½ pound of Epsom salts (instead of common salt), and the copper in a porous flower pot containing a solution of sulphate of copper (¼ pound). This I found to work admirably, and, when connected with an electromagnetic machine, to give shocks too severe to be withstood by most persons. This battery worked finely for several weeks, when the porous pot was accidentally broken. I substituted another, but it would not work for the reason, as I conceived, that the pot was not sufficiently porous; but upon changing the pot for one which was found to be porous, the battery again worked and continued in force for some time. If the solutions were placed wrong, as D. B. contends, how does he account for the successful working of my battery?—G. A. B., of D. C.

A. M., of N. Y.—Multiplying the diameter of a circle by 3·0075, will not give even a very coarse approximation to the area of a circle. Multiplying the square of the diameter by 0·7853 gives a very fine approximation, so near indeed as to be sufficiently accurate for any practical purposes.

S. A. R.—A combined atmospheric and lifting pump will enable you to raise the water to the hight required. It is possible that at the hight of your place above the sea level, the atmospheric pump alone might fail. Any dealer in pumps will supply you, or refer you to someone who can.

BLUEING SMALL ARTICLES.—Make a box of sheet iron, fill it with sand, and subject it to a great heat. The articles to be blued must be finished and well polished. Immerse the articles in the sand, keeping watch of them until they are of the right color, when they should be taken out, and immersed in oil. This is the way many pistol barrels are blued. C. W. L.

CLEANING GUN BARREL.—I saw a statement in an old paper that mercury rolled about in a gun barrel would clean it when foul, and that the same mercury would also do for several successive cleanings. F. S. of Conn. [We doubt the efficiency of this, but if mercury would clean gun barrels, we think it an unnecessarily expensive substance for the purpose.—EDS.

C. C. C., of Ohio.—We think a wooden would be far preferable to a concrete vat for holding vinegar. Our opinion is that both the vinegar and the concrete would be injured by the contact with each other.

APPLICATIONS FOR EXTENSION OF PATENTS.

SHEARS FOR CUTTING METAL.—Timothy F. Taft, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing, August 2 1871.

APPARATUS FOR SUSPENDING EAVES TROUGHS.—James A. Watrous, Green Spring, Ohio, has petitioned for an extension of above patent. Day of hearing, August 16, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row

© 1871 SCIENTIFIC AMERICAN, INC.

Recent American and Foreign Patents.

nder this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

ROLLING METAL.—Charles White, William Lewis, Thomas Strickland, and Samuel Caddick, of Spuyten Duyvil, N. Y.—Power is applied at each end of a revolving frame through a system of bevel gearing. Each of the rolls is revolved on its own axis, simultaneously with the frame and in the same direction, but at reduced speed. Revolving the rolls and frame in the same direction counteracts the revolving motion imparted, by the rolls to the iron, in manufacturing long bars. The rolls are placed obliquely to each other so that their action is not only to crush but to elongate. The iron or other malleable metal is fed into the machine through a hollow journal, and is caught by the rolls and gradually worked forward until it is forced out of another hollow journal in a finished state.

CARRIAGE TOP.—William Bander, of Circleville, Ohio.—The upright brace is pivoted to the second bow from the back of the frame. From this point extends a horizontal jointed brace forward to the front brace, and another horizontal jointed brace, backward to the rear bow. The horizontal braces are worked by tongues projecting from the upper end of the upright brace.

SEWING MACHINE FOR BOOTS AND SHOES.—Nathan M. Roslusky, of New York city.—The details of this machine are numerous, as the nature of the invention would imply, comprising an adjusting apparatus for bringing the high and low places, in the sole and in the shank, into the proper position for the action of the needle; a suitable holder for the last and the boot or shoe stretched upon it; a hooked shaped needle working through what the inventor styles a tubular discharger, for casting off the loops of thread formed by the needle in passing through the leather; with apparatus for giving the needle motion, etc., only to be understood by reference to the drawings. Seven claims are made in the patent specification, covering devices which seem well adapted to make the machine an efficient one.

HARVESTER BINDER.—This invention furnishes an attachment for harvesting machines, whereby the cut grain is taken as it falls upon the platform, pushed back, gathered into gavels, bound securely, and then pushed off the machine. As might be expected, it is somewhat complicated, yet apparently not so much so as to derogate from its efficiency and durability. The method, by which the binding cord is passed about the gavel and tied, is a most ingenious piece of mechanical invention. The cord is carried on a spool, and is wound off as wanted, and cut after tying, the whole being performed automatically. As a specimen of elaborate invention, and reasoning back from ends to means, this invention will compare favorably with anything lately brought to our notice. The inventor is Joseph Barter, of La Crosse, Wis.

PROPELLER.—Reuben W. Heywood, Baltimore, Md.—This invention relates to an apparatus for propelling canal boats, in which a reciprocating carriage, armed with hinged blades that are placed transversely of the boat, travels back and forth lengthwise of the boat, the said blades, when the carriage is moving in one direction extending down into the water, and communicating to the boat the motion derived from the resistance of the water, and said blades, when the carriage is moving in the other direction, folding up against the bottom of the boat, and consequently imparting no motion thereto.

SELF-FILLING BOBBIN WINDER.—Robert H. Smith, Baltimore, Md.—This invention has for its object to lay thread from the spool evenly upon the bobbin of a sewing machine shuttle, and consists of a shaft, on which is cut a right and left screw, the threads of which occupy the same space, intersecting each other at diametrically opposite points; and in a fork which follows one of the threads from end to end, and then enters the other thread and travels back again; and in a carriage which holds the fork and receives a reciprocating movement back and forth; and in a thread guide connected with said carriage, which, by means of said reciprocating motion, lays the thread evenly upon the bobbin.

GLOVE.—Remus D. Burr, Kingsboro, N. Y.—This invention relates to gloves whose backs are made of some cheaper material such as cloth, and consists in a front piece, cut with a tongue on its thumb side, at the lower corner, and with a recess between said finger and the rest of the front piece, the tongue forming a re-inforce for the thumb side of the hand, and the recess being for the reception of a tongue formed on the thumb piece. The invention also consists in a thumb piece cut with a tongue on its palm side for the purpose of being joined to the aforesaid tongue of the front piece' and cut with another tongue that fits into the recess, aforesaid, of the front piece at or near the base of the thumb, for the purpose of giving the space necessary for the free action of the thumb.

REGULATOR FOR SEWING MACHINES.—Alexander B. Bates, Baltimore, Md.—This invention relates to an improvement on the patent of T. A. Macauley, January 24, 1871, wherein is described a mechanism for varying the length of the stitch, which mechanism is connected with the inner end of the shaft that passes through the side of the cloth table, and is operated by turning said shaft by hand, by means of a knob placed upon its outer end. The invention consists in an apparatus for automatically turning said shaft, for the purpose of regulating the feed, combined with a graduated plate, which answers the purpose both of indicating how many stitches will be produced to the inch at each different position of the lever by which said apparatus is worked, and of holding said lever in any position desired.

GIRDER RESTS FOR TIMBERS.—This is the invention of Jonathan Preston, of Boston, Mass. It consists of a rest or bearing of cast metal, so made that it can be slipped on to the lower flange of the girder before the latter is put in its place. The ends of the rods project from the girder, so as to give a fair and broad bearing for the timbers which the girders are destined to support.

EXTENSION TABLE.—In this table the extension is performed by a screw running in a nut held by a transverse bar. One end of the nut revolves in a plate attached to the table, the screw revolving in, but having no longitudinal motion through, the plate. The screw turns by means of a crank key, in a tube attached at one end to the extension end of the table; or tubes made to telescope one within the other may be used, either with or without the screw, the parts of the table being made to keep their proper relation to each other by means of rabbeted strips and slides. Invented by F. Souweine, of New York city.

DOVETAILING MACHINE.—John B. Ritchey, of Pomeroy, Ohio. In this machine, the board to be cut is clamped upon a table, which is guided by sliding way and gages, so as to bring the board into contact with the cutter at the desired intervals, the guides, gages, and stops being so arranged that the cutting may be done at wider or narrow intervals, as required. The mortises and tenons are not straight on their sides, but curved in a graceful manner. The mandrel carrying the cutter is fixed in a vertically sliding frame or gate, which is worked by a hand lever. While much cheaper than some other forms of dovetailing machines running gangs of cutters, this machine can, we think, do excellent work.

PLOW.—Thomas H. Reynolds, of Rome, Ga.—The standard is of metal, bi-urcated at the lower end. The plowshare has a projecting lug on the back-side, which rests upon a shoe formed at the front end of a slotted bar, the share and the shoe being locked together by a bolt or pin. A suspended slide, arranged on the slotted bar, forms the land side of the plow, and from the van of the slotted bar descends a shank, having a small pointed share, penetrating considerably deeper than the regular depth of the furrow, and calculated for subsoiling.

STEAM MANGLE.—Wherever steam can be applied, it is found to be the best and most economical conveyer and distributer of heat. Taking advantage of this valuable property of steam, P. Rundquist, of New York city, has invented a mangle in which the rollers are heated by steam, admitted through stuffing boxes in the ends of the journals. The rollers can be heated to any desired temperature by regulating the pressure of steam in the boiler which supplies them. The rollers are compressed together by stirrups, rods, and springs.

SCREW JACK.—Hackley T. Morrison, Lawrenceville, Va.—This invention has for its object to enable a screw jack to work continuously, (either while lifting or lowering, and while the lever by which the screws are rotated is turning back, as well as while it is turning forward), to the end that there may be no lost motion, which object is accomplished by the provision of two separate screws, arranged one above the other, one of which raises or lowers itself in the foot-piece, while the other raises or lowers the head-piece, said screws working alternately.

HEMMER AND BINDER FOR SEWING MACHINE.—Milo Harris, Jamestown, N. Y.—This invention consists in the combination with a hemmer and binder, having a scroll for turning a hem on cloth, of a plate pivoted at one end to the shank of the hemmer, extending through a slot in the back of the scroll, and terminating at such a point within the scroll as to serve as a stop to prevent the cloth, while running through the hemmer, from turning up at the edge against the back of the scroll, and making an uneven hem.

WRINGER.—Cyrus E. Carter, Martinsville, Ohio.—This invention relates mainly to the application, to the upper roller of a wringing machine, of an apparatus worked by a treadle, for drawing said roller downward, so as to make it press the article to be wrung between itself and the lower roller with all necessary force.

CHURN.—This is the invention of Benjamin H. Steele, of Barnesville, Ohio. Dashers of two peculiar forms are attached to a vertical shaft, and made to revolve back and forth by means of a bevel pinion attached to the lower end of the shaft, and a sector bevel gear, worked by a hand lever. The second or gathering dasher is in the form of the letter S, and replaces the first when the butter is ready to gather.

DEVICE FOR OPENING AND CLOSING WINDOW BLINDS.—The blind is provided with a bar, bent at right angles, so as to form a long staple, the body of which forms a slide for an eye in the end of a bar pivoted to the jamb of the window casing. This apparatus is placed low down near the window sill. A notched bar passes through under the sash, the notches of which engage with a keeper fastened to the window sill, so that the blind may be opened to any desired position and held there. Invented by Frederick Shattner, of Wilmington, Del.

MORTISING BLIND STILES.—This invention consists in the application of ingenious, and, we think, efficient, devices for holding the stile of the blind while being mortised and bored; and also in the feeding of the stile. It is the invention of Lawe M. Collins, of Lebanon, N. H. Any bevel or angle of the mortises, required in such work, is secured by the devices used.

SAW MILL.—The line of teeth in the saw is made rounding or convex, toward the log to be cut: and the bottom of the sash is made to move towards and from the wood during its downward stroke by means of a rock shaft connected with the lower part of the sash by a forked arm, the forked end joining the sash. The rock shaft is moved by an eccentric on the crank shaft of the saw, through a suitable connecting rod joining the eccentric and a crank on the rock shaft. The saw is moved backwards until half way down, then forward till about seven eighths of the way down, then backward again to the end of the stroke. The setting of the eccentric on the crank shaft governs this motion; and the inventor claims that a smoother cut can be thus produced than by methods hitherto employed. Invented by Charles C. Lewis, of Bay City, Mich.

PRUNING SHEARS.—Albert Barling, Westchester, Pa.—This invention relates to a pruning shears, in which the cutting is effected by a blade working past a serrated hook, the edge of the blade that comes next to the hook being beveled to prevent its catching on the latter, and the edge of the hook next the blade being longitudinally recessed, for the same purpose.

INVALID BEDSTEAD.—A. J. Russell, Baltimore, Md.—This invention consists in an apparatus for raising and supporting one or both of the patient's legs, said apparatus being composed of a pair of standards connected at their lower ends with the windlasses that are placed, one at each side of the cot, on which the patient lies, the upper ends of said standards being united by a cross bar that passes transversely above the cot, on which cross bar is a sliding frame bearing pulleys, with which is connected the cord that is used for elevating the patient's leg.

SAWING MACHINE.—H. P. Ohm, Baltimore, Md.—This invention relates to a portable sawing machine for the use of farmers and mechanics, and consists principally in the mechanism whereby the feeding of the carriage that supports the wood to be sawn is effected from the same shaft that operates the saw.

RAILROAD CAR RUNNING GEAR.—Reuben Winslow, Lock Haven, Pa.—This invention has for its object to practically enlarge the outer wheels of a railroad car and diminish the inner wheels, during the time the car is running on a curve, for the purpose of enabling the outer wheels to travel the greater distance, which they have necessarily to accomplish, as compared with the inner ones, without the slipping of the wheels on either side along the track, or the binding and excessive friction which attend the passage of running gear, as ordinarily constructed, over curves.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—NOISY GEARS.—I am in trouble with two large cog wheels, which appear to be running as near right as can be, yet they make such a noise, and always have, that I can hardly stand it, and I fear for my hearing if I continue to run them in this way. I have tried everything that I know of, and if any of your correspondents can give me any information on the subject, I shall ever feel grateful for the same.—S. R.

2.—BOILS.—Will some kind reader give me a preventive for boils, which will do no injury to the system?—W. E.

3.—CUTTING SCREWS.—In cutting screws with a lathe, can the connection between head and feed screw be so arranged that the feed screw alone can be reversed without getting out of time, so as to avoid a cross belt to the counter shaft?—W. E.

4.—SOFTENING RUBBER HOSE.—I have rubber hose for my pump, that, lying idle, have become hard and stiff. How can I soften them and make them pliable?—J. P.

5.—HOUSE MOTH.—Just at this time many of your readers are particularly interested in knowing as much as possible about the common house moth, so troublesome to all housekeepers having carpets and other woolen fabrics to take care of. Will some of your scientific, practical correspondents give us a sketch of its natural history, and of the best mode of fighting it, both offensively and defensively?—E. A. T.

6.—DRAWING INK.—I wish to procure a good drawing ink, one that when used in the ruling pen will produce a deep black, and not a blue or gray one? Where can I procure such ink, or how can I make it?—W. R. S.

7.—SIZING CONE PULLEYS.—Will some of your readers tell me what is the best and simplest rule to determine the relative diameters of cone pulleys working together, as on lathes, etc., so that the belt shall be equally tight on any and all of the different speeds? also, when a train of different sized pulleys is set in motion by one driver, what is the best rule to find out the speed of the last pulley, as compared with that of the first driver?—J. E.

8.—GALVANIZING CAST IRON.—Can some one give me some information about galvanizing cast iron? I can do wrought iron without any trouble, but cannot make the zinc adhere to the cast. Any information in regard to galvanizing will be gladly received. Do parties that do galvanizing on a large scale allow visitors in their works?—T. L.

9.—CLEANING GUN.—F. S. S., of Ohio, says he has been using a rifle gun for fifteen years, and has to wipe or clean it for the first time. For the benefit of rifle shooters, will he please state what kind of powder he uses? I find that all of our Eastern powder leaves a residue in the cone or breech, which necessitates the taking of the gun apart to clean after a few month's use. Another thing: if I did not wipe the gun occasionally, it would be impossible to push the ball home, without tearing the patch, although it is a very fine rifle.—C. W. L.

10.—CANAL BOATS.—Seeing in your three last issues of the SCIENTIFIC AMERICAN, the very liberal reward offered by your State for a motor other than animal power for canal purposes, adaptable to the present construction of boats, your correspondent wishes to know the following: 1st. Average depth of canal. 2d. Build of said boats most common in use wall sided or not. 3d. Average draft of boat when light, and also when laden with cargo. Answers to the foregoing will help me considerably.—G. T.

Inventions Patented in England by Americans.

May 2 to May 8, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

ACETIC ACID.—Theodore Schwartz, New York city.
LAMP BURNER.—R. S. Merrill, Boston, Mass.
LIQUID METER.—J. F. de Navarro, New York city.
OSCILLATING ENGINE.—J. Goulding, Worcester, Mass.
PULVERIZING ORES.—Van B. Ryerson, New York city.
RETORT.—Junius Gridley, New York city.
SEWING MACHINE.—W. G. Beckwith, Newark, N. J.
SUBSTITUTE FOR HAIR CLOTH.—J. J. Comstock, Providence, R. I.
WATERPROOF COMPOUND.—P. E. Minor, Schenectady, N. Y.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000 Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present, to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE,

FOR THE WEEK ENDING MAY 23, 1871.

Reported officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$1
On each Trade-Mark	$25
On filing each application for a Patent, (seven'teen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1856 *at which time the Patent Office commences Printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

115,010.—SETTEE.—W. C. Adams, W. B. Mayhew, West Tisbury, Mass.
115,011.—ANCHOR.—A. B. Babbitt, Taunton, Mass.
115,012.—DOOR SECURER.—B. F. Baer, Lancaster, Pa.
115,013.—ROOT CUTTER FOR PLOWS.—J. W. Baker, Elkton, Md.
115,014.—HEATING STOVE.—Frank Barclay, Aurora, Ill.
115,015.—VAPOR BURNER.—W. E. Bartlett, Newburg, N. Y.
115,016.—WAGON TONGUE SUPPORT.—Wm. Beers, Milan, O.
115,017.—SEASONING HUBS.—A. Benninghofen, Hamilton, O.
115,018.—COOLER.—T. Bergner, S. Zeisse, Philadelphia, Pa.
115,019.—RULER.—Edward Bostock, Philadelphia, Pa.
115,020.—FLAX SEPARATER.—James Boyce, Muncie, Ind.
115,021.—STOVE GRATE.—Pardon Boyden, Amsterdam, N. Y
115,022.—PULLEY BLOCK.—G. C. Brown, Brooklyn, N. Y.
115,023.—SPITTOON.—S. G. Cabell, Washington, D. C.
115,024.—EARTH CLOSET.—R. A. Cannall, New Orleans, La.
115,025.—DAMPER.—E. H. Clinton, W. H. Lavinia, Chicago, Ill
115,026.—HARROW AND PLANTER.—R. J. Colvin, Lancaster, Pa.
115,027.—HEATING CARS.—J. H. Connelly, Wheeling, W. Va.
115,028.—GAS.—J. H. Connelly, J. McLure, Wheeling, W. Va.
115,029.—CEMENT-PIPE MOLD.—D. Copeland, Jr., Rochester, N. Y
115,030.—DRAIN PIPE.—David Copeland, Jr., Rochester, N. Y.
115,031.—ROASTING FURNACE.—F. W. Crosby, Washington, D. C.
115,032.—MEDICINE.—C. P. Crossman, West Warren, Mass.
115,033.—CULTIVATOR PLOW.—David Culver, Kingston, Pa.
115,034.—WAGON SIDE BRACE.—T. H. Daniels, Anderson, Ind.
115,035.—LANTERN GLOBE HOLDER.—J. S. Dennis, W. F Kistler, Chicago, Ill.
115,036.—SEWING MACHINE.—P. Diehl, L. Oehring, Chicago, Ill.
115,037.—LOCK.—J. W. H. Doubler, Darlington, Wis.
115,038.—DOOR STOP.—M. V. Doyle, Jacob Behel, Rockford, Ill.
115,089.—PASTE MACHINE.—Robert Dutt, New York city.
115,040.—HANDLE FASTENING.—E. F. Dunaway, Cincinnati, O
115,041.—INKSTAND.—Thomas Duncan, Brookville, Md.
115,042.—REVERSIBLE CRIB.—A. E. Eaton, Portland, Me.
115,043.—BED BOTTOM.—M. W. Farber, Mount Pleasant, Iowa.
115,044.—SEWING MACHINE.—T. M. Farrand, Skowhegan, Me
115,045.—LAMP WICK.—John Farrell, Brooklyn, N. Y.
115,046.—CORN HARVESTER.—D. C. Flint, Bardolph, Ill.
115,047.—CLEANER FOR OIL WELL.—W. Forker, Rockland, Pa
115,048.—SEWING MACHINE.—W. H. Fowler, W. Pettingall Painesville, Ohio.
115,049.—MOLDER'S SLICKER.—W. J. Fryer, Jr., New York city
115,050.—DRAW HOOK.—B. G. Gardiner, New York city.
115,051.—SIRUP AND SUGAR.—J. J. Grosheinz, Logelbach, Fr.
115,052.—HARVESTER RAKE.—James Harris, Janesville, Wis.
115,053.—FRONT FALL FOR PIANOS.—A. H. Hastings, New York.
115,054.—INVALID BEDSTEAD.—Wm. Heath, Bath, Me.
115,055.—CORN HARROW.—George Hill, Galva, Ill.
115,056.—HOLLOW VESSEL.—W. F. Holske, New York city.
115,057.—RIDING PLOW.—B. C. Hoyt, Fort Atkinson, Wis.
115,058.—MOTOR MACHINE.—I. G. Hubbard, Nokomis, Ill.
115,059.—LANTERN GLOBE HOLDER.—J. H. Irwin, Phila., Pa.
115,060.—SEWING MACHINE CASTER.—H. Jones, Richmond, Ind.
115,061.—HARNESS CHECK HOOK, ETC.—W. V. Kay, Chicago, Ill

© 1871 SCIENTIFIC AMERICAN, INC.

115,062.—HANESS PAD TREE.—Wm. V. Kay, Chicago, Ill.
115,063.—SHUTTER FASTENER.—Peter Keffer, Reading, Pa.
115,064.—HORSESHOE NAILS.-E. W. Kelley, Hamilton, Scotland.
115,065.—ARTIFICIAL LIMB.—S. B. Kepperling, T. B. Kreiter, Neffsville, Pa.
115,066.—COMB GUIDE FOR BEEHIVE.—H. A. King, New York.
115,067.—MEAT SAFE.—August Knoche, St. Louis, Mo.
115,068.—CALK SHARPENER.—G. W. Lane, Chichester, N. H.
115,069.—ATTACHING PLOW HANDLES.-J. L. Laughlin, Peru, Ill.
115,070.—DENTAL POLISHER.—H. Laurence, New Orleans, La.
115,071.—HORSE HAY RAKE.—J. G. Lockwood, Davenport, N. Y.
115,072.—COOLING BEER.—Jacob Lorenz, Hamilton, Ohio.
115,073.—SPRING FOR TREADLE.—H. Lull, Hoboken, N. J.
115,074.—RAILWAY STOCK CAR.—W. M. Lyon, Salem, Ohio.
115,075.—BOOT HEELS, ETC.—F. Marquard, Newburyport, Mass.
115,076.—WASHING MACHINE.—W. C. Marr, J. S. Maughlin, Onawa City, Iowa.
115,077.—PIANO ACTION.—L. Matt, B. Greuter, Boston, Mass.
115,078.—WHIFFLETREE.—R. W. McClelland, Springfield, Ill.
115,079.—HEATING STOVE.—John McCoy, Philadelphia, Pa.
115,080.—COFFEE POT.—J. T. McNamee, Baltimore, Md.
115,081.—THRASHING MACHINE.—A. McNaught, Alliance, O.
115,082.—WATER WHEEL.—A. H. Merriman, W. Meriden, Conn.
115,083.—JAPANNED LEATHER.—F. S. Merritt, Boston, Mass.
115,084.—EXCAVATOR.—S. Miller, E. Claringdon, Waterloo, N. Y.
115,085.—SPOON.—H. C. Milligan, South Orange, N. J.
115,086.—LIFTING JACK.—H. T. Morrison, Lawrenceville, Va.
115,087.—EXTENSION TABLE SLIDE.—S. B. Nash, Buffalo, N. Y.
115,088.—TUB, PAIL, ETC.—P. H. Niles, Boston, Mass.
115,089.—VAPOR BURNER.—A. F. Noble, Indianapolis, Ind.
115,090.—WATCHMAKER'S GAGE.—T. Noel, Memphis, Tenn.
115,091.—COCK.—S. Norton, Stockport, Great Britain.
115,092.—SAWING MACHINE.—H. P. Ohm, Baltimore, Md.
115,093.—KEY HOLE PROTECTOR.—J. H. Parker, Waltham, Ms.
115,094.—CANE STUBBLE SHAVER.—F. F. Patout, Jeanerett, La.
115,095.—SPINNING MACHINE.—O. Pearl, Lawrence, Mass.
115,096.—KEY BOARD.—J. P. Perry, Yarmouth Port, Mass.
115,097.—BARREL CAR.—W. A. Plantz, Iowa Falls, Iowa.
115,098.—TRUSS.—William Pomeroy, New York city.
115,099.—CLOTHES CLAMP.—C. L. Poorman, Bellaire, Ohio.
115,100.—TANNING.—F. P. Porcher, Charleston, S. C.
115,101.—CIGAR MOLD.—John Prentice, New York city.
115,102.—WIRE FASTENING.—H. W. Putnam, Bennington, Vt.
115,103.—SAW ARBOR.—Jacob Rand, Boston, Mass.
115,104.—CAR COUPLER.—T. Ray, Pelham, Canada.
115,105.—WASHING MACHINE.—C. P. Remington, Smith's Mills, N. Y.
115,106.—HAY PRESS.—Eugene Rock, Greenvale, N. Y.
115,107.—STUPEFYING BEES.—A. Y. Rozenbury, Waterloo, Ind.
115,108.—BEDSTEAD.—A. J. Russell, Baltimore, Md.
115,109.—LAUNDRY BOX.—Mary A. H. Saurman, Phila., Pa.
115,110.—SPLINT.—A. F. Scow, Chicago, Ill.
115,111.—FURNACE.—T. P. Scripter, Des Moines, Iowa.
115,112.—CIDER MILL.—G. Seger, Humberstone, Canada.
115,113.—CLEVIS.—John H. Shaw, Inlet, Ill.
115,114.—BRIM OF HAT.—J. Sheldon, Newark, N. J.
115,115.—EXCAVATOR.—J. Shelly, Mahanoy, and M. C. Bullock, Pottsville, Pa.
115,116.—BURIAL CASE.—I. C. Shuler, Amsterdam, N. Y.
115,117.—SEWING MACHINE.—W. Sidenberg, New York city.
115,118.—CUTTING PRESS.—N. S. Simonds, Woburn, Mass.
115,119.—REGISTERING PUNCH.—J. H. Small, Buffalo, N. Y.
115,120.—MOVING HAY.—A. Smith, Hoosick Four Corners, N. Y.
115,121.—MEDICINE CASE. H. M. Smith, New York city.
115,122.—FIFTH WHEEL.—J. P. Smith, Hillsborough, Ohio.
115,123.—PLANTER.—P. E. Smith, Scotland Neck, N. C.
115,124.—SEWING MACHINE.—R. H. Smith, Baltimore, Md.
115,125.—STUMP PULLING MACHINE.—W. Smith, Tomah, Wis.
115,126.—COTTON PRESS.—W. M. Smith, Augusta, Ga.
115,127.—OIL TANK.—H. F. and G. S. Snyder, Williamsport, and Antes Snyder, Freeport, Pa.
115,128.—HAMMOCK.—J. M. K. Southwick, Newport, R. I.
115,129.—BRAKE BLOCK.—I. W. Spore, New Scotland, N. Y.
115,130.—BRAKE.—W. I. Spore, New Scotland, N. Y.
115,131.—LEATHER, ETC.—L. H. Stanley, G. B. Draper, Attleborough, Mass.
115,132.—HOE.—John Stilwell, Griffin, Ga.
115,133.—WAGON TONGUE.—L. E. Stilwell, Franklinville, N. Y.
115,134.—COFFEE POT.—O. M. Tinkham, Pomfret, Vt.
115,135.—DAMPER.—Albert Tracy, Paris Hill, Me.
115,136.—PRINTERS' FURNITURE.—J. F. Uhlborn, Sacramento, Cal.
115,137.—ELECTRICAL TREATMENT.—M. H. Utley, Montreal, C.
115,138.—CULTIVATOR.—L. Walker, Victoria, Texas.
115,139.—WASHING MACHINE.—H. Warner, Ridgeway, Pa.
115,140.—CARRIAGE JACK.—A. H. Wellbrock, Boston, Mass.
115,141.—HARVESTER RAKE.—G. H. Weller, New Village, N. J.
115,142.—RAILROAD RAIL.—E. Williams, Batavia. N. Y.
115,143.—MINER'S LAMP.—W. C. Winfield, Hubbard, Ohio.
115,144.—BUTTER WORKER.—P. G. Woodard, Waterford, Pa.
115,145.—STEAM ENGINE.—J. C. Woodhead, Alleghen yCity, Pa.
115,146.—NAME PLATE FOR ORGAN STOPS.—C. E. Bacon and W. J. Kent, Buffalo, N. Y.
115,147.—SASH FASTENER.—G. L. Bailey, Portland, Me.
115,148.—REPAIRING RAILS.—H. Baines, Toronto, Can.
115,149.—PATCHING RAILS.—H. Baines, Toronto, Can.
115,150.—CLOTHES WRINGER. E. G. W. Bartlett, Providence, R. I.
115,151.—SEWING MACHINE.—A. B. Bates, Baltimore, Md.
115,152.—CARRIAGE SEAT.—S. W. Beach, Ypsilanti, Mich.
115,153.—SMOKE STACK.—L. Bell, Washington, D. C.
115,154.—LIGHTING APPARATUS.—A. P. Berlioz, Paris, France.
115,155.—SEWING MACHINE.—C. Beuttel, Cincinnati, Ohio.
115,156.—PUNCHING MACHINE.—E. R. Brown, Mauch Chunk, and James Long, Packerton, Pa.
115,157.—CUTTER FOR CUTTING WASHERS.—E. R. Brown, Mauch Chunk, and James Long, Packerton, Pa.
115,158.—WAGON SEAT.—L. H. Bullock, Champaign City, Ill.
115,159.—CULTIVATOR.—T. F. Capp, Bloomington, Ill.
115,160.—SPINNING RING.—W. T. Carroll, Midway, Mass.
115,161.—CLOTHES WRINGER.—C. E. Carter, Martinsville, O.
115,162.—PLANT GROWER.—B. B. Chadwick, Buffalo, N. Y.
115,163.—BUTTON HOLE MACHINE.—W. Chicken, Boston, Mass.
115,164.—SAND EJECTOR.—M. Christiansen, Winneconne, Wis.
115,165.—FENCE.—L. N. Clark, Brighton, Mich.
115,166.—SPADES AND SHOVELS.—L. D. Clift, Philadelphia, Pa.
115,167.—GATE.—D. M. Cochran, L. A. Hawkins, Richmond, Ind.
115,168.—CHIMNEY COLLAR.—J. H. Congdon, Coventry, R. I.
115,169.—SHOE.—E. S. Converse, Boston, Mass.
115,170.—WASHING MACHINE.—F. L. Copps, Atlanta, Ill.
115,171.—ROTARY ENGINE.—James Cox, Belle Plaine, Iowa.
115,172.—STAMP MILL.—J. M. Crawford, Philadelphia, Pa.
115,173.—CENTER BOARD.—A. G. Crossman, Huntington, N. Y.
115,174.—WASHING MACHINE.—J. Curtis, North Parma, N. Y.
115,175.—BLIND STAPLES.—B. C. Davis, Binghampton, N. Y.
115,176.—FASTENER.—J. Z. Davis, San Francisco, Cal.
115,177.—CHURN DASHER.—S. F. Dolloff, Bloomington, Ill,
115,178.—WINDOW SHADE.—A. S. Dickinson, Brooklyn, N. Y.
115,179.—CHUCK FOR LATHE.—R. H. Dowling, Fenton, Mich.
115,180.—TAILOR'S MEASURE.—I. Du Bois, Brooklyn, N. Y.
115,181.—GUN CARRIAGE.—J. B. Eads, St. Louis, Mo.
115,182.—CARBURETING.—George Edmonds, New Orleans, La.
115,183.—FOLDING BOX.—N. and J. Erpelding, Chicago, Ill.
115,184.—THILL COUPLING.—J. H. Fleming, Dundee, Mich.
115,185.—CARDING MACHINE.—J. F. Foss, Lowell, Mass.
115,186.—LAND MEASURER.—Wm. Frasius, Chatsworth, Ill.
115,187.—ROCK DRILL.—Gideon Frisbee, Titusville, Pa.
115,188.—SAMPLE BOX.—J. C. W. Frishmuth, Philadelphia, Pa.
115,189.—BURNER.—T. S. Gates, A. H. Fritchey, Columbus, O.
115,190.—PLATFORM SCALE. W. P. Goolman, Kansas City, Mo.
115,191.—SPINNING MACHINE. J. Goulding, Worcester, Mass.
115,192.—SCHOOL DESK.—G. H. Grant, Richmond, Ind.
115,193.—GAS-BURNING FURNACE.—J. Green, Philadelphia, Pa.
115,194.—TURNING LOGS.—D. S. Griffes, Flint, Mich.
115,195.—SHOW CASE.—W. H. Grove, Philadelphia, Pa.
115,196.—FORGING AXLES.—J. Harrington, Bridgeport, Conn.
115,197.—SEWING MACHINE.—Milo Harris, Jamestown, N. Y.
115,198.—PNEUMATIC ENGINE. J. F. Haskins, Fitchburg, Mass.
115,199.—HARVESTER DROPPER.—I. Hedges, Radnor, Ohio.
115,200.—STEAMING APPARATUS.—L. M. Heery, Hinsdale, Ms.
115,201.—THRASHER.—G. W. Heiges, Franklintown, Pa.
115,202.—BLEACHING.—J. Helm, Jr., New Brunswick, N. J.
115,203.—FINISHING CLOTH, ETC.—C. Heubach, Chicago, Ill.
115,204.—PROPELLER.—J. W. Heywood, Baltimore, Md.
115,205.—FIRE KINDLER.—J. R. Hice, Salem, Ohio.
115,206.—HEEL FOR BOOTS.—A. L. Holbrook, Fremont, Neb.
115,207.—VULCANIZING.—B. M. Hotchkiss, Naugatuck, Conn., and G. M. Allerton, New York city.
115,208.—STEAM ENGINE.—John Houpt, Springtown, Pa.
115,209.—COTTON BOLLS.—J. Hughes, New Berne, N. C.
115,210.—SCROLL SAW.—H. H. Humphrey, and Henry Bickford, Cincinnati, Ohio.
115,211.—BUNG BORER.—W. A. Ives, New Haven, Conn.
115,212.—VELOCIPEDE.—B. Janson, Effingham, Ill.
115,213.—CULTIVATOR.—Moses Johnson, Three Rivers, Mich.
115,214.—MOLDER'S FLASK.—E. F. Jones, Foxborough, Mass.
115,215.—ROACH OR BUG TRAP.—J. M. Keep, New York city.
115,216.—FIRE KINDLER.—A. B. King, Camden, ohio.
115,217.—TURBINE.—J. J. Knowlton, Saccarappa, Me.
115,218.—BRICK MACHINE.—J. L. Kucker, Philadelphia, Pa.
115,219.—BOOT HEEL.—R. C. Lambert, Quincy, Mass.
115,220.—ALLOY.—G. M. Levi, Brussels, C. M. Kunzel, Liege, Belgium.
115,221.—SAFE.—S. S. B. Lewis, W. H. Sterling, Troy, N. Y.
115,222.—ANIMAL TRAP.—Christopher Long, Newark, Ohio.
115,223.—THRASHING MACHINE. M. H. Mansfield, Ashland, O.
115,224.—CHECK REIN.—A. P. Mason, Franklinville, N. Y.
115,225.—BALE TIE.—J. R. McClintock, New Orleans, La.
115,226.—COTTON GIN. F. M. McMeekin, Morrison's Mills, Fla.
115,227.—SHELLING CORN.—J. Miller, N. Dubrul, Joliet, Ill.
115,228.—COFFEE ROASTER.—R. L. Mills, Springfield, Ohio.
115,229.—CORPSE PRESERVER.—G. W. Nash, Columbus, Ohio.
115,230.—LOCK.—Jacob Obernesser, Cincinnati, Ohio.
115,231.—LOCK.—Jacob Obernesser, Cincinnati, Ohio.
115,232.—SCHOOL DESK.—John Peard, New York city.
115,233.—SPINNING MACHINE.—O. Pearl, Lawrence, Mass.
115,234.—WASH BOILER.—H. W. Pell, Rome, N. Y.
115,335.—BUSTLE.—G. V. Pierce, Jersey City, N. J.
115,236.—CAR COUPLING.—Hiram Plumb, Philadelphia, Pa.
115,237.—HEAD BLOCK.—H. M. Popple, Warren, Pa.
115,238.—ATTACHING NAPKINS. P. H. Raiford, Houston, Texas.
115,239.—PRIVY.—Frank Riedel, San Francisco, Cal.
115,240.—GRAIN DRYER.—Alfred Robert, Paris, France.
115,241.—ATTACHING BOOMS.—E. Rogers, Waterford, Conn.
115,242.—COUPLING.—J. Royal, M. A. Lentz, J. M. Deibert, La Fayette, Ind.
115,243.—STEEL.—E. L. Seymour, New York city.
115,244.—DUMPING WAGON.—Jacob Skeen, Mound City, Ill.
115,245.—FIFTH WHEEL.—Jacob Skeen, Mound City, Ill.
115,246.—FIFTH WHEEL.—Jacob Skeen, Mound City, Ill.
115,247.—LUBRICATOR.—G. E. Smith, Fitchburg, Mass.
115,248.—PULLEY BLOCK.—H. Smith, Providence, R. I.
115,249.—LOCK NUT.—L. J. Smith, New York city.
11 ,250.—TOWEL RACK.—P. A. Snyder, Jersey City, N. J.
115,251.—FLUTING MACHINE.—H. Sommer, C. Bauer, Newark.
115,252.—TRAP BALL.—C. F. Spencer, Cleveland, Ohio.
115,253.—BUNG CUTTER.—A. W. C. Sternberg, Davenport, Iowa.
115,254.—ROTARY PUMP.—H. P. Tenant, E. Germantown, Ind.
115,255.—SEWING MACHINE.—G. Thompson, Springfield, Ill.
115,256.—EARTH CLOSET.—C. A. Wakefield, Pittsfield, Mass.
115,257.—TOOL HANDLE.—C. G. Wegner, Philadelphia, Pa.
115,258.—FIREARM.—Eli Whitney, New Haven, Conn.
115,259.—BLOWING MACHINE.—J. M. Williams, Conn'ville, Ind.
115,260.—SASH HOLDER.—B. Wilmot, Montana, Iowa.
115,261.—CAR TRUCK.—R. Winslow, Lock Haven, Pa.
115,262.—LAMP.—F. Yeiser, S. W. Hedger, Lancaster, Ky.
115,263.—WASHING MACHINE.—T. Tebow, Lexington, Ky.

REISSUES.

4,388.—MACHINE FOR HUSKING CORN.—L. A. Aspinwall, Albany, N. Y.—Patent No. 101,809, dated April 12, 1870; reissue No. 4,099, dated August 16, 1870; reissue No. 4,174, dated Nov. 8, 1870.
4,389.—BOLT FOR SAFES.—G. L. Damon, Cambridge, Mass.—Patent No. 102,780, dated May 10, 1870.
4,390.—LATHE.—L. R. Faught, Philadelphia, Pa.—Patent No. 60,163, dated December 4, 1866.
4,391.—Division A.—WATER METER.—National Meter Company, New York city.—Patent No. 92,884, dated July 20, 1869.
4,392.—Division B.—WATER METER.—National Meter Company, New York city.—Patent No. 92,884, dated July 20, 1869.
4,393.—BOILER.—W. B. Scaife, Pittsburgh, Pa.—Design No. 4,224, dated July 12, 1870.
4,394.—BAYONET.—H. Waters, Boston, Mass.—Patent No. 47,590, dated May 2, 1865.
4,395.—HARVESTER RAKE.—J. C. Durborow, Ellicott City, Md.—Patent No. 78,654, dated June 9, 1868
4,396.—REGULATING VALVE.—B. Holly, Lockport, N. Y.—Patent No. 94,748, dated September 14, 1869.
4,397.—PARAFFIN.—F. Lambe, London, England.—Patent No. 102,135, dated April 16, 1870; patented in England, December 4, 1868.
4,398.—IRON BRIDGE.—D. H. Morrison, Dayton, Ohio.—Patent No. 70,245, dated October 29, 1867.

DESIGNS.

4,916.—STOVE.—J. Beesley and J. J. Ferris, Philadelphia, Pa.
4,917.—CARPET PATTERN.—J. Crabtree, Philadelphia, Pa.
4,918.—CARPET PATTERN.—J. Crabtree, Philadelphia, Pa.
4,919.—MEDAL.—S. L. Denney, Christiana, Pa.
4,920.—CARPET PATTERN.—J. Fisher, Enfield, Conn.
4,921.—DRINKING GLASS.—G. B. Fowle, Cambridge, Mass.
4,922.—CHAIN PUMP.—H. L. Fry, Cincinnati, Ohio.
4,923.—GLOVE.—W. B. Green, Mayfield, N. Y.
4,924.—HOUSING PLATE.—J. L. Haven, Cincinnati, Ohio.
4,925.—CARPET PATTERN.—H. S. Kerr, Philadelphia, Pa.
4,926.—CARPET PATTERN.—H. S. Kerr, Philadelphia, Pa.
4,927.—OILCLOTH PATTERN.—V. E. Meyer, Lansingburg, N. Y.
4,928.—CARPET PATTERN.—E. J. Ney, Dracut, Mass.
4,9 8.—CARPET PATTERN.—E. J. Ney, Lracut, Mass.
4,930.—LATCH.—J. Ottner, New Britain, Conn.
4,931.—OILCLOTH PATTERN.—C. L. Pierpont, Salem, N. J.
4,932.—OILCLOTH PATTERN.—C. L. Pierpont, Salem, N. J.
4,933.—TRUNK HANDLE.—T. L. Rivers, Newark, N. J.
4,934.—LAMP SHADE.—J. B. Russell, Wheeling, W. Va.
4,935.—KINDLING WOOD.—J. L. Seymour, Washington, D.C.
4,936.—STREET LAMP.—T. D. Stetson, New York city.
4,937.—PAPER BAG.—S. W. Valentine, Bristol, Conn.
4,938.—DRAWER.—H. P. Wetmore, Elizabeth, N. J.
4,939.—CLOCK FRONT.—J. H. Bellamy, Charlestown, Mass.
4,940.—REFRIGERATIVE BUCKET.—J. Liming, Phila., Pa.
4,941.—BROILER.—J. T. Page, Rochester, N. Y.

TRADE MARKS.

266.—LUBRICATING OIL.—F. M. Backus, Cleveland, Ohio.
267.—PREPARATION FOR THE HAIR.—G. C. Barclay, N. Y. city.
268.—BEER.—B. Bates, Baltimore, Md.
269.—MACHINERY.—J. Cooper, Mount Vernon, Ohio.
270.—FURNISHING GOODS.—Fisk, Clark, & Flagg, New York.
271.—FURNISHING GOODS.—Fisk, Clark, & Flagg, New York.
272.—LEAF TOBACCO.—S. Hernsheim, New Orleans, La.
273.—SHIRT.—Hutchinson & Thomas, Baltimore. Md.
274.—TOBACCO.—W. S. Kimball & Co., Rochester, N. Y.
275.—WHISKY AND BITTERS. A. K. Lewis & Co., Covington, N. Y.
276.—FRUIT JAR.—Mason Manufacturing Co., New York city.
277.—HORSE NAIL.—N. Horse Nail Company, Chicago, Ill.
278.—COOKING STOVE.—Perry & Co. Albany, N. Y.
279.—TOBACCO.—E. T. Pilkinton, Richmond, Va.
280.—MEDICINE.—G. Reno, Titusville, Pa.
281.—PAPER.—Rock River Paper Company, Beloit, Wis.
282.—BURNING FLUID.—B. A. Rose, Urbana, Ohio.
283.—VINEGAR AND CIDER.—Rowe, Graves & Co., Chicago, Ill.
284.—FRYING PAN.—S. Smith, New York city.
285.—FISH.—The American Club Fish Co., New York city.
286.—TEA.—Fusiyama Tea Importing Co., Pittsburgh, Pa.
287.—STOVE.—Scranton Stove and Manf'g Co., Scranton, Pa.
288.—BOOTS AND SHOES.—J. H. Walker, Worcester, Mass.
289.—LEATHER.—Walker, Oakley & Co., Chicago, Ill.

EXTENSIONS.

MACHINERY FOR COMPRESSING GASEOUS BODIES.—W. A. Royce, of Newberg, N. Y.—Letters Patent No. 17,394, dated May 26, 1857.
CORN HUSKER.—Evelyn F. French, New York city.—Letters Patent No. 17,269, dated May 12,1857.
NAIL PLATE FEEDING MACHINE.—J. C. Gould, Oxford, N. J.—Lette s Patent No. 17,273, dated May 12, 1857; reissue No. 2,301, dated July 10, 1866.
MODE OF FASTENING SHEET METAL ON ROOFS, ETC.—Asa Johnson, Brooklyn, N. Y.—Letters Patent No. 17,331, dated May 19, 1857.
MANUFACTURING SHOE BINDING.—E. L. Norton, Charlestown, Mass.—Letters Patent No. 17,445, dated June 2, 1857.
PLOW.—J. S. Hall, Pittsburgh, Pa.—Letters Patent No. 17,430, dated June 2, 1857.

GREAT VALUE OF PATENTS.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are hundreds of others who have realized large sums—from fifty to one hundred thousand dollars—and a multitude who have made smaller sums, ranging from twenty-five thousand to fifty thousand dollars, from their patents. The first thing requisite for an inventor to know is, if his invention is patentable. The best way to obtain this information, is either to prepare a sketch and description of the invention, or construct a model, and send to a reliable and experienced patent solicitor, and ask advice.

In this connection inventors are informed that

MUNN & CO.,

Publishers of the

Scientific American,

37 Park Row, New York,

Have been engaged in the business of Soliciting Patents for nearly twenty-five years, and have the most extensive facilities for transacting such business, of any concern in the world. M. & Co. have examined and reported more than

50,000 INVENTIONS,

And prepared the papers for more than

25,000 APPLICATIONS

For Patents during the last quarter of a century.

For the past ten years, the cases filed in the Patent Office by them, are about ONE THIRD of the entire number of applications filed. Their corps of specification writers and counselors are made up from the ranks of the Patent Office, and are men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office.

MUNN & CO.

Offer their services in preparing

Specifications and Drawings for Patents, Caveats, Reissues, Designs, Trade Marks, Extensions, Interferences, and Assignments.

They also prosecute

REJECTED APPLICATIONS,

Which have been improperly prepared by the inventor or incompetent attorneys. Good inventions are often rejected for no other reason than that the cases were not properly presented to the Patent Office.

Inventors should bear in mind that Patents are often worth more in foreign countries than in the United States, and the reduced prices for which they are now obtained in England, France, and in other countries, render it within the means of most persons to patent their inventions abroad.

For instructions concerning

FOREIGN PATENTS,

REISSUES,

INTERFERENCES,

HINTS ON SELLING PATENTS,

RULES AND PROCEEDINGS AT THE UNITED STATES PATENT OFFICE,

THE PATENT LAWS, FEES, ETC., SEE

"HINTS TO INVENTORS,"

Which is sent free by mail on application. Advice free. Everything confidential. Address all communications to

MUNN & CO.,

PUBLISHERS

SCIENTIFIC AMERICAN,

37 Park Row, New York,

Office in Washington, corner of F and Seventh streets.

© 1871 SCIENTIFIC AMERICAN, INC.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - 1·00 a line,
Inside Page - - - 75 cents a line,

for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

BAIRD'S BOOKS

FOR PRACTICAL MEN.

THE undersigned begs to announce that his **REVISED CATALOGUE of April 15, 1871, 94 pages, 8vo.,** so long in preparation, is now ready for delivery. In it will be found many new and highly important books, and the list, taken as a whole, is confidently submitted to the American public, as THE BEST ASSEMBLAGE OF PRACTICAL AND SCIENTIFIC BOOKS EVER OFFERED BY ANY ONE PUBLISHER, IN THIS COUNTRY OR ENGLAND. Many thousand readers of the SCIENTIFIC AMERICAN have, in the past, sent for his Catalogue, and large orders have been received for this one. All who have not ordered this edition are, individually and collectively, especially invited to send their addresses, and catalogues shall be promptly sent, FREE OF POSTAGE.

HENRY CAREY BAIRD,

INDUSTRIAL PUBLISHER,

406 Walnut st., Philadelphia, Pa.

Important to Painters & Sign Writers.

NOW READY.

Sign Writing and Glass Embossing: A Complete Practical Illustrated Manual of the Art. By JAMES CALLINGHAM. 12mo. $1.50

A Complete Guide for Coach Painters. By M. ARLOT. 12mo. $1.2

The Painter's Guide and Varnisher's Companion. 12mo. $1.5

The Interior Decorator. Illustrated by D. R. HAY. 12mo. $2.25

The above, or any of my books, sent by mail, free of postage, at publication prices. My new and enlarged **Catalogue of Practical and Scientific Books,** 94 pages, sent free of postage to any address.

HENRY CAREY BAIRD,

INDUSTRIAL PUBLISHER,

406 Walnut street, Philadelphia, Pa.

NORWALK IRON WORKS, Sole Proprietors and Makers of the Norwalk Engine and Earle Steam Pump, Stationary and Portable Engines, Direct Acting and Balance Wheel Steam Pumps, Air and Vacuum Pumps, Heavy Iron and Brass Castings.
Salesroom, cor. Center and White streets, New York.

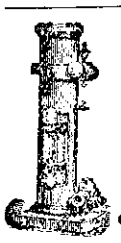
A LARGE DEALER IN AGRICULTURAL MACHINERY in Europe invites the manufacturers thereof, principally the makers of Self-Raking Reapers, to submit their Catalogues, with particulars in regard to discount and terms.
Please address P.O. Box 3443, New York.

PATENT RIGHTS and PATENTED ARTICLES sold on commission. Agents wanted. Several first-class inventions for sale. Patents taken out.
MOODY & CO., 7 Murray st., New York city.

1832. SCHENCK'S PATENT. **1871.**

WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.



Independent Steam BOILER SUPPLY, OR *Feed Pump,*

RELIABLE FOR HOT OR COLD WATER.

Circulars sent free. COPE & CO.,
No. 118 East 2d st., Cincinnati, Ohio.

Universal Wood Worker.

FOR Agricultural, Railroad, Car, Carriage, and Wagon Works, Planing Mill, Sash, Door and Blind, Bedstead, Cabinet and Furniture Factories.
McBETH, BENTEL & MARGEDANT, Hamilton, O.

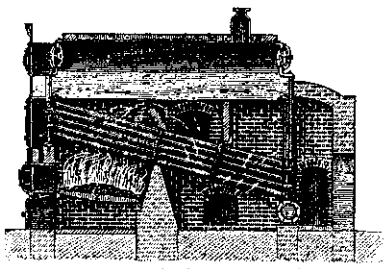
MACHINISTS.

Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 123 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio.

First Premium, American Institute, 1871.

MICROSCOPES, Magnifying Lenses, etc., for Botanical, Mineralogical, and Scientific Investigations in General. Illustrated Price List free to any address. T. H. McALLISTER, Optician, 49 Nassau st., N. Y.



BABCOCK & WILCOX'S

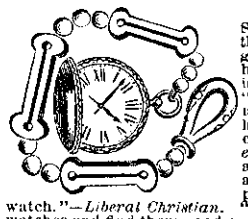
TUBULOUS STEAM BOILER

Has the following advantages:
Safety from explosion.
Economy of fuel.
Perfect circulation.
Saving of cost and time in repairs.
Perfectly dry steam.
Accessibility of all parts for cleaning, inside and out.
Ease and economy of transportation.
The following are some of the parties who have these boilers in use:

Calvert Sugar Refinery, Baltimore, Md. ..... 500 H.P.
Wood, Weeks & Co., " " " ..... 600 "
Bridgewater Paper Co., Chester, Pa. ..... 120 "
Jonathan Tyson " " Woodville, Pa. ..... 50 "
D. Trainer & Son, Cotton Mill, Linwood, Pa. ..... 100 "
Henry Caloman Saw Mills, So. Bethelam, N. Y. ..... 50 "
Beardsley Nickel & M'f'g Co., Nickel Platers, N.Y. 50 "

BABCOCK & WILCOX,
Builders of Steam Engines and Boilers,
41 Courtland st., New York.

Collins' Gold Metal Watches.



Prices $15, $20, $25. Sent C.O.D. to any part of the United States. "The goods of C. E. Collins & Co. have invariably given satisfaction."—*N. Y. Times.* "One of their $20 watches is worn in our office, and we have no hesitation in recommending them."—*Pomeroy's Democrat.* "They are excellent timekeepers, and for all practical purposes as good as a fine gold watch."—*Liberal Christian.* "We have examined the watches and find them good and low priced."—*Philadelphia Press.* "Every watch is warranted; the works are reliable, and in all respects equal to a gold watch costing $200."—*La Crosse Republican.* "They look as well, and keep as good time as watches cost ing $150."—*City Item, Philadelphia.* Address C. E. COLLINS & CO.,
335 Broadway, New York.

JUST PUBLISHED.

The New Elements of Hand-railing.

REVISED EDITION.

CONTAINING FORTY-ONE PLATES, thirteen of which are now for the first time presented. Together with accompanying letter-press description. The whole giving a complete elucidation of THE ART OF STAIR BUILDING. By ROBERT RIDDELL, Author of the "Carpenter and Joiner," etc. 1 vol. folio. Price $7.

CLAXTON, REMSEN & HAFFELFINGER,
PUBLISHERS,
819 and 821 Market st., Philadelphia.
New York: ORANGE JUDD & CO., and by Booksellers generally.

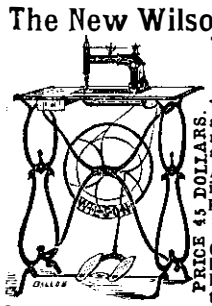
ONE of the most useful and valuable inventions of the age. **The Patent Fireproof Mica Lamp Chimney** will never break by heat or cold. State rights for the exclusive sale by
THE VICTOR SAFETY LAMP CO.,
226 Pearl st., New York.

PRIZE MEDAL SCROLL SAW.—
THOS. L. CORNELL, Derby, Conn.

DUTCHER'S Lightning FLY KILLER.
DUTCHER'S DEAD SHOT for Bed Bugs.
TRY THEM, AND SLEEP IN PEACE.

WANTED.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "THE TANITE CO." Stroudsburg, Pa.

The New Wilson Under-Feed.



THE BEST & CHEAPEST FIRST CLASS SHUTTLE SEWING MACHINE IN THE WORLD.
Warranted for five years, and the warranty indorsed by a capital of half a million of dollars.
AGENTS WANTED in unoccupied territory. For particulars address Wilson Sewing Machine Co.
Cleveland, O.; St. Louis, Mo.; Providence, R. I.; Philadelphia, Pa.; Boston, Mass.; Pittsburg, Pa. Louisville, Ky.; Cincinnati, O.; Indianapolis, Ind.; Memphis, Tenn.; Chicago, Ill.; Milwaukee, Wis.; Toledo, O.; Albany, N.Y.; St. Paul, Minn.; Richmond, Va.; Montgomery, Ala.; New Orleans, La.; Galveston & Houston, Tex.; San Francisco, Cal.; or
No. 707 BROADWAY, NEW YORK

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

STEEL CASTINGS

TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE,
14 North 5th st., Phila.; 42 Cliff st., New York.

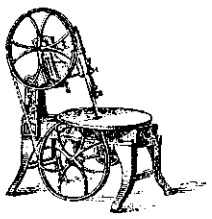
WANTED.—Gun and Cartridge Machinery of all kinds, new or second-hand. Address WINCHESTER REPEATING ARMS COMPANY, New Haven Conn.

$100 to $250 *per month guaranteed. Sure pay.* Wages paid weekly to Agents everywhere, selling our *Patent Silver Mold White Wire Clothes Line.* Business permanent. For full particulars address GIRARD WIRE MILLS, Phila., Pa.

OSCAR BARNETT'S
MALLEABLE AND GREY IRON FOUNDERIES AND MACHINE WORKS, Newark, N. J.
Brass Molders Flasks a specialty. Faces and Ears Planed off and made interchangeable.

PLATINUM. H.M. RAYNOR, 25 Bond st., N. Y.

PATENT BANDSAW MACHINES



Of the most approved kinds, of various sizes, to saw bevel as well as square, without inclining the table, by **FIRST & PRYIBIL,** 452 to 456 Tenth ave., New York. Price $250, $275, $350, and $400. At present (Oct. 16), there are in operation, in this city alone, 88 of our machines. Send for circular. Manufacture, also, an improved saw-filing apparatus; price, $30. Have also on hand a large stock of best FRENCH BANDSAW BLADES.

BROOKLYN

WHITE LEAD CO.,

Perfectly Pure White Lead,

RED LEAD AND LITHARGE.
Office 89 Maiden Lane, New York.

THE CELEBRATED

Cold-rolled Shafting.

THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose, causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.

GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chamber st., New York.

Sturtevant Blowers.

THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chamber st., New York.

L. & J. W. FEUCHTWANGER, 55 Cedar st., New York, Chemists, Importing and Manufacturing. Silicates of Soda and Potash, Soluble Glass in all forms, Steel and Glass Makers', Potters' and Enamelers' Materials, Pure Metallic Oxides and Metals, Hydrofluoric Acid. All articles of the best quality, and orders promptly attended to. Publishers of Treatises on "Soluble Glass," "Gems," and "Fermented Liquors."

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

MACHINERY, NEW and 2d-HAND.... Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

P. BLAISDELL & CO.,

MANUFACTURERS of the "BLAISDELL" PATENT DRILL PRESSES, with quick return motion, Agricultural Drills, Improved Engine Lathes, from 12 in. to 28 in. swing, Planers, Gear Cutters, Boring Mills, Hand Lathes, and other first-class Machinists' Tools.
Jackson st., Worcester, Mass.

Agents! Read This!

WE WILL PAY AGENTS A SALARY OF **$30 per week** and expenses, or allow a large commission, to sell our new and wonderful inventions.
Address M. WAGNER & CO., Marshall, Mich.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG, & RICHARDSON.

VINEGAR, how made in 10 hours, without drugs. Particulars 10 cts F. SAGE, Cromwell, Conn.

Tanite Emery Wheels

AND GRINDING MACHINES.
S. A. WOODS, General Agent.
Machinery Depot, 91 Liberty st., New York.

RAILROAD MEN find all the latest railroad news, descriptions and illustrations of railroad improvements, also articles on railroad management and engineering, by practical railroad men, in the RAILROAD GAZETTE, 72 Broadway, New York, and 112 Madison st., Chicago. Four dollars a year; ten copies for $35; 40 copies for $120. Sent with *Engineering*, the great English journal, for one year, $13.

$150 A MONTH! EMPLOYMENT EXTRA INDUCEMENTS!
A premium HORSE and WAGON for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $20.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

SILICATE OF SODA, IN ITS VARIOUS forms, manufactured as a specialty, by Philadelphia Quartz Co., 788 South 2d st. Philadelphia, Pa.

CINCINNATI BRASS WORKS.—Engineers and Steam Fitters' Brass Work, Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

ALLCOTT'S LATHES, for Broom, Hoe, and Rake Handles, for sale by
L. W. POND, 98 Liberty st. New York.

Wanted—Agents. **$75** TO $250 PER MONTH, everywhere, male and female, to introduce the GENUINE IMPROVED COMMON-SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price, only $15. Fully licensed and warranted for five years. We will pay $1,000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which that amount can be made. Address SECOMB & CO.,
Boston, Mass.; Pittsburgh, Pa.; St. Louis, Mo., Chicago, Ill.

HOWARD'S IMPROVED ADJUSTABLE MITER MACHINES. **Agents wanted.** Wholesale Picture Frame and Woodworking Machinery dealers please apply. HOWARD MANUFACTURING Co., Belfast, Maine.

AGENTS WANTED IN EVERY CITY AND TOWN IN THE UNITED STATES. Send for particulars to LABAN, HEATH & CO.,
30 Hanover st., Boston, Mass.

MACHINISTS' TOOLS, at greatly reduced prices. Also, some Woodworth Planers and Second-hand Tools. 97 to 112 E. R. ave., Newark, N. J.
E. & R. J. GOULD, successors to Gould Measuring Co

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application.

IMPORTANT

TO MACHINISTS.—The Best Metal for all Machine Uses is the MARTIN STEEL, made by THE NEW JERSEY STEEL AND IRON CO., Trenton, N. J. This steel is made by an entirely different process from any other, and is tougher than wrought iron. It can be turned without annealing, being entirely free from hard spots. Every one who uses it pronounces it just what they have long wanted, for a multitude of uses, such as Crank Pins, Lathe Spindles and Screws, Cotton Machinery Rollers, Saw and Fan Spindles, etc., etc. Also, particularly adapted for Firebox Plates. Prices low. Send for further information, or a sample, stating use to which it is to be applied.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (40 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co., Union Iron Mills, Pittsburgh, Pa.

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 67 Sudbury street, Boston

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash, and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st. New York. 17 1

Reynolds'

TURBINE WATER WHEELS.

The Oldest and Newest. All others only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT
96 Liberty st., New York.
Gearing, Shafting.

Niagara Steam Pump.

CHAS. B. HARDICK,
Adams st., Brooklyn, N. Y.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery, Models for the Patent Office, built to order by HOLSKE MACHINE CO., Nos. 528, 530, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

WANTED—AGENTS, $20 PER DAY, TO sell the celebrated HOME SHUTTLE SEWING MACHINE. Has the under-feed, makes the "lock stitch" alike on both sides, and is fully licensed. The best and cheapest Family Sewing Machine in the market. Address
JOHNSON, CLARK & CO.,
Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill., or St. Louis, Mo.

Andrew's Patents.

Noiseless, Friction Grooved, Portable, and Warehouse Hoisters.
Friction or Geared Mining & Quarry Hoisters.
Smoke-burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

FRAGRANT SAPOLIENE

CLEANS KID GLOVES, and all kinds of Cloths and Clothing; removes Paint, Grease, Tar, etc., INSTANTLY, without the least injury to the finest fabric. Sold by Druggists and Fancy Goods Dealers. FRAGRANT SAPOLIENE CO., 33 Barclay street, New York; 46 La Salle street, Chicago.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st., New York.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-Iron Pipe, Boiler Tubes, etc. Hotels Churches, Factories, & Public Buildings heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st., N. Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't.

AMERICAN GRAPHITE CO.,
24 CLIFF ST., NEW YORK.
MINES AND WORKS, TICONDEROGA.

Standard unequaled grades **PLUMBAGO** perfected expressly for

Stove Polish; Glazing Powder, Shot, &c.; Paint, Crucibles, Pencils, Electrotyping, Piano and Organ action, and for *lubricating machinery of every description.*

Grades for Special Uses prepared to order.

UNRIVALLED Hand Saw Mill, Self-feeding, with ease. Rip 3-in. lumber; guaranteed do work of 3 men. The only hand saw machine known, does as represented. Thousands in use. Send for circular.
WM. H. HOAG, Sole Manufacturer, 214 Pearl st. N. Y

SHINGLE AND HEADING MACHINE—Law's Patent with Trevor & Co.'s Improvements. The Simplest and Best in use. Also, Shingle, Heading and Stave Jointers, Equalizers, Heading Turners, Planers etc. Address TREVOR & CO., Lockport, N. Y.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks Conn.

WATCH *free* and $30 a day sure, no humbug. Address, with stamp, BATTA & Co., Pittsburgh, Pa.

© 1871 SCIENTIFIC AMERICAN, INC.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

THE BAND SAW!

Its ORIGIN and

HISTORY, with Engravings of the OLDEST MACHINE, sent gratis. Address RICHARDS, KELLEY & CO., 22d st. (above Arch), Philadelphia.

FOR SALE, by the Patentees, an interest in a **Gang Lathe** for woodturning, balusters, bed posts, table legs, etc. A machine will do the work of twenty turners, and make FOUR HUNDRED BALUSTERS in an HOUR. Two Machines now running.

An interest, or rights for individual States, will be sold. Address W. F. W., P. O. Box 153, New York city.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st.; Works, Paterson, N.J.

FREEMAN & BURR,

CLOTHING, **138 & 140 Fulton St., New York.** CLOTHING,

FREEMAN & BURR have very great pleasure in inviting an inspection of their immense Stock for the present season. It embraces the choicest products of the Loom from every part of the world, both in the piece and made up for immediate wear, for all ages and all occasions.

SPRING OVERCOATS, $5—$10. SUITS, $10—$15. BOYS' SUITS, $5—$8.
SPRING OVERCOATS, $15—$20. SUITS, $20—$30. BOYS' SUITS, $10—$12.
SPRING OVERCOATS, $25—$30. SUITS, $40—$50. BOYS' SUITS, $15—$20.

CLOTHING, **ORDERS BY LETTER** promptly filled. FREEMAN & BURR'S Easy and Accurate System for SELF-MEASURE enables parties in any part of the country to order Clothing direct from them, with the certainty of receiving the most PERFECT FIT attainable. CLOTHING,

RULES FOR SELF-MEASURE, Samples of Goods, Price List, and Fashion Sheet, SENT FREE on application.

WANTED.—A good workman at sash doors and mouldings can have a permanent job with ARLINGTON MANUFACTURING CO., Arlington, Vt.

DRILLS

DIAMOND POINTED
STEAM DRILLS.

FOR ALL KINDS OF ROCK DRILLING, Mining, Quarrying, Tunneling, Railroad Grading, Well Boring, Prospecting, etc. Fifty to Seventy-five per cent of cost and time of hand labor saved. "Test Cores," in form of solid cylinders of rock or mineral taken out of mines from any depth not exceeding one thousand feet, showing true value, stratification, etc. No percussion. Never require sharpening. FIRST PREMIUMS awarded in both American and Europe. Illustrated Circulars sent on application. Beware of infringements.

SEVERANCE & HOLT,
Proprietors and Manufacturers,
Office 16 Wall st. New York.

JUST ISSUED FOR 1871-2.

WILSON'S NEW YORK

BUSINESS DIRECTORY,

Containing every business in New York City indexed and classified alphabetically under appropriate headings; *a valuable hand-book for all who make purchases in New York.* Sent postpaid to any part of the United States on receipt of *two dollars.* Address

JOHN F. TROW, PUBLISHER,
52 GREENE ST., NEW YORK.

N.Y. City Directory $5, and Co-Partnership Directory $2.

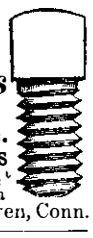
☞ Orders by mail promptly attended to.

☞ Sample pages of the *Business Directory* will be sent to any address on receipt of stamp.

REYNOLDS & CO.

MANUFACTURE
Screws & Bolts
For Machinery of every variety.
ALSO
Bridge and Roof Bolts.
STEEL & IRON SET SCREWS

A specialty. Also, Small Articles for Patentees, in great numbers, a No. 145 East st., New Haven, Conn.



Roper Caloric Engine Co.

Removed to 124 Chambers st. Send for circular.

NOW READY.

The Young Mechanic.

By the author of "The Lathe and Its Uses."

CONTAINING directions for the use of all kinds of Tools, and for the construction of Steam Engines and Mechanical Models, including the art of Turning in Wood and Metal. Fac simile of the London edition, with American revisions. Fully Illustrated. Square 8vo., cloth, $1.75.

For sale by all booksellers, or sent postpaid, on receipt of price, by

G. P. PUTNAM & SONS,
4th ave. and 23d st., New York.

Wood Working Machinery.

ALL kinds of Machinery used by Cabinet-makers. Also, best Gauge Lathe, made for nulling, as well as all kinds of handles. Address, for catalogue, T. R. BAILEY & VAIL, Lockport, N.Y.

$250 A MONTH easily made with Stencil and Key-Check Dies. Secure Circular and Samples, FREE. S. M. SPENCER, Brattleboro, Vt.

$375 A MONTH—Horse and outfit furnished. Address NOVELTY CO., Saco, Me.

BRITANNIA IRON WORKS, Bedford, England, London office, 4 Cheapside, Manufacturers of Steam Plowing and Cultivating Machinery, Howard's Patent Safety Boilers and Agricultural Implements.

Messrs. Howard, Proprietors of above works, having had numerous applications and inquiries respecting their various patents for improved Agricultural Implements and Steam Generators, have interested Mr. JOHN EVERITT, of New York, in the American branch of their interests, to whom all applications for American Agencies, Royalties, or Rights, can be made. Address, 168 Fulton st., N.Y.

MACHINISTS', BOILER MAKERS', AND SMITHS' TOOLS, for sale at a great sacrifice. One Fairbain's Riveting Machine, with appurtenances; 1 large 42 in. Power Shears (Novelty Iron Works pattern); 1 Power Table Punch (DeLamater Works pattern); 1 set Power Bending Rolls; 1 ten ton Machine Shop Crane; together with a large lot of Turning Lathes, Drilling Machines, Portable Drills, Boring Bars, Machinists', Boiler Makers' and Smiths' Hand Tools (both iron and cast steel), Shafting, Pulleys, Hangers, and 6 Fairbanks' Platform Scales. Send for catalogue or apply at the South Brooklyn Steam Engine Works, cor. Imlay and Summit sts., Brooklyn.

$10 A DAY FOR ALL with Stencil Tools. Address A. E. GRAHAM, Springfield, Vt.

GEO. W. READ & CO.,
MANUFACTURERS AND IMPORTERS,

VENEERS,

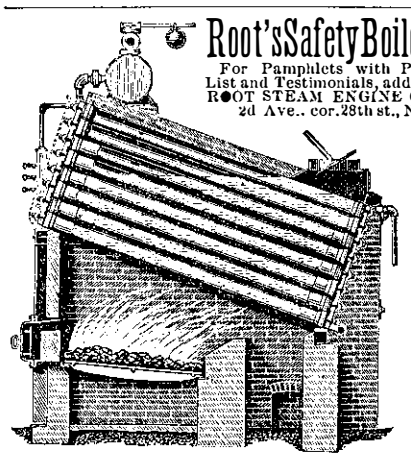
FANCY WOODS & BOARDS,

Have in store the finest assortment ever seen, particularly FRENCH VENEERS, HUNGARIAN ASH, ETC., to which they invite the particular attention of the trade. Send for catalogue and price list.

For SALE, one of the best and largest VENEER CUTTING MACHINES in the country.

170 and 172 Centre st.

Factory, 186 to 200 Lewis st.



Root's Safety Boiler.

For Pamphlets with Price List and Testimonials, address ROOT STEAM ENGINE CO., 2d Ave., cor. 28th st., N.Y.

The Best in the Market.

L. L. SMITH & CO.,
Nickel Platers,

6 HOWARD ST., New York,
Between Elm and Centre.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price Lists mailed on application to JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse, No. 117 Liberty street.

TRADE MARK.

Union Stone Co.,

Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular. **32 Pemberton Square, BOSTON, MASS.**

THE
Allen Engine Works.

THE ALLEN ENGINE.

Fourth avenue and 130th and 131st sts. New York city Manufacturers of

Porter's Governor,
The Allen Boiler, and
Standard Straight Edges, Surface Plates, and Angle Plates.

Four first premiums were awarded to us at the Fair of the American Institute, 1870.

Send for our illustrated circular.

L. W. Pond---New Tools.

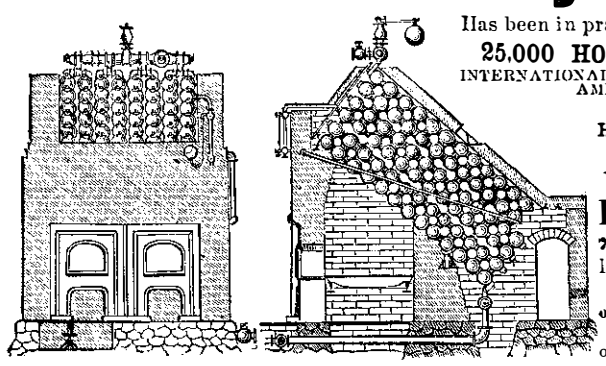
EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes. Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.

Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.

A. C. STEBBINS New York Agent.

Harrison Safety Boiler.



Has been in practical use for than ten years.

25,000 HORSE POWER IN USE.

INTERNATIONAL MEDAL, LONDON, 1862.
AMERICAN INSTITUTE MEDAL, 1869.

SEND FOR CIRCULARS TO
HARRISON BOILER WORKS
Philadelphia, Pa.

Weston's Patent Differential
PULLEY BLOCKS.

75,000 in use. Address
HARRISON BOILER WORKS
Philadelphia,
or **JOHN A. COLEMAN, Agent**
110 BROADWAY, New York,
or 189 FEDERAL ST., Boston, Mass.

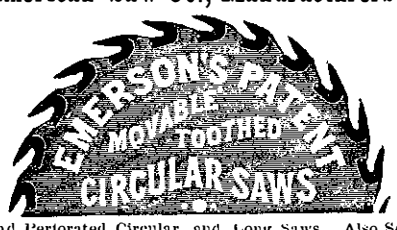
An Important Fact.

MARVIN & CO.'S
SPHERICAL SAFES
Have never been Robbed.

Hundreds are in use by Banks, Bankers, and Merchants.

Warehouses, 265 Broadway, New York.
721 Chestnut st., Philadelphia.
108 Bank st., Cleveland.
93 Main st., Buffalo.

American Saw Co., Manufacturers of



And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

BUILDING PAPER

OF THREE GRADES.

TARRED SHEATHING.

For outside of Studding, under Clapboards. A non-conductor of cold, heat, and dampness.

PREPARED PLASTERING BOARD,

a cheap and perfect substitute for lath and plaster; makes a smooth, warm, and substantial wall, at less than half the usual cost.

DOUBLE THICK ROOFING

and Quartz Cement, make a good water and fire-proof roof, for less than $3. 50 per square.

Sample and Circulars sent free, by
ROCK RIVER PAPER CO.,
Chicago; or
B. F. HALE,
22 & 24 Frankfort street, N. Y.

United Nickel Co.,

EXCLUSIVE OWNERS of Dr. Isaac Adams', Jr., Patents for Electro-Plating with Nickel, having removed their business office to Boston, all applicants for License, or others having business with the Company, will address GEO. D. ALLEN, TREASURER,
No. 24 Kilby st., Boston, Mass.

RUMPFF & LUTZ,

IMPORTERS and Manufacturers of Aniline Colors and Dyestuffs, Colors for Paperhangers and Stainers. Reliable recipes for Dyeing and Printing on Silk, Wool, and Cotton. All new improvements in the art of Dyeing, and new Colors are transmitted to us by our friends in Europe, as soon as they appear.
42 Beaver street, New York.

Working Models

And Experimental Machinery, Metal, or Wood, made to order, by J. F. WERNER 62 Centerst. N.Y.

THE
Tanite Emery Wheel.

Does not Glaze, Gum, Heat, or Smell. Address
THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

A. S. & J. GEAR & CO., Boston, furnish every description of Wood and Iron Working Machinery and Supplies. The best in use, regardless of maker, at lowest possible rates.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars. Agents Wanted. MURGILL & KEIZER, Baltimore, Md.

HEAVY CASTINGS

For Forge and Mill Work. The M. & T. SAULT CO. Steam Engine Builders & Founders, New Haven, Conn.

NEW AND SECONDHAND IRON PLANERS, LATHES, DRILLS, etc., for sale low. Send for Circular. W. A. JAMES & CO.,
195 Lake st., Chicago.

BUILDERS and all who contemplate building, supplied with full description of "Village Builder" free. Address A. J. BICKNELL & CO., Publishers, 27 Warren st., New York.

RAILROAD MEN, who hope for promotion, read the RAILROAD GAZETTE, published at 72 Broadway, New York, and 112 Madison st., Chicago. Sample numbers 10 cts.

SPERM OIL, *strictly pure*, for SEWING MACHINES and fine Machinery, in bottles, cans, barrels, and casks. W. F. NYE New Bedford, Mass.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO New Haven Conn.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

WATER-PROOF
BUILDING PAPER

(No TAR), for Roofing, Sheathing, Ceilings, Oil-cloths Shoe Stiffenings, Tags, Trunks, Cartridges, Blasting Pass-book Covers, Grain and Flour Bins, etc., for sale by J. HUNTER, JR.,
Paper Warehouse, 59 Duane st. New York.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, at the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Tables of Power, address

THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

Newspaper Advertising.

A Book of 125 closely printed pages, lately issued, contains a list of the best American Advertising Mediums giving the names, circulations, and full particulars concerning the leading Daily and Weekly Political and Family Newspapers, together with all those having large circulations, published in the interest of Religion, Agriculture, Literature, etc., etc. Every Advertiser, and every person who contemplates becoming such, will find this book of great value. Mailed free to any address on receipt of 25c.

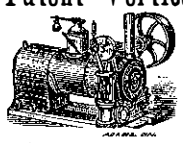
GEO. P. ROWELL & CO.,
Publishers, No. 40 Park Row, New York.

The Pittsburgh (Pa.) Leader, in its issue of May 29, 1870 says:

"The firm of G. P. Rowell & Co., which issues this interesting and valuable book, is the largest and best Advertising Agency in the United States, and we can cheerfully recommend it to the attention of those who desire to advertise their business SCIENTIFICALLY and SYSTEMATICALLY in such a way that is, so as to secure the largest amount of publicity for the least expenditure of money."

$2.50 A LINE for an advertisement in Kellogg's Inside Track List of 265 Western Country Newspapers. Best and cheapest medium of its kind in the world. Address A. N. KELLOGG, 110 and 112 Madison st., Chicago.

Patent Vertical Portable Engine.



Our guarantee is—more steam, less fuel, stronger in running, safer to run, less frictious, and more durable, than any Old Style Portable, with Engine on Boiler, of same dimensions. Our Saw Mills are strong and well made—Lever Head Blocks, with Patent Roller set; quick setting, and correct when sawing. Stationary Engines and Boilers. Address GRIFFITH & WEDGE, Zanesville, Ohio.

WANTED.—A responsible dealer in every town in the United States, to sell "The Tanite Co.'s" Emery Wheels and Emery Grinders. Extra inducements from May 1st. Send for terms to "THE TANITE Co., Stroudsburg, Pa.

HOTCHKISS BRICK AND TILE MACHINE.—Send for Circular to Room 7, No. 19 Cliff street, New York.

HARTFORD
Steam Boiler
INSPECTION & INSURANCE CO.

CAPITAL.....$500,000

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS.

The business of the Company includes all kinds of

STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the

HOME OFFICE, in Hartford, Conn.,

or at any Agency.

J. M. ALLEN, President. C. M. BEACH, Vice Pres.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen.....President.
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney....Ass't Treas. Cheney Bros. Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co.
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
Hon. Chas. M. Pond.....Tres. State of Connecticut.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire-Arms Man'f'g Co.
Austin Dunham..... Pres. Willimantic Linen Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
Earl P. Mason....Pres't Prov. & Wor. R. R., Providence.
Wm. Adamson..of Baeder, Adamson & Co., Philadelphia.

New York Office.....**239 Broadway.**

THOS. S. CUNNINGHAM, Manager
R. K. McMURRAY Inspector

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia and 59 Gold st. New York.

© 1871 SCIENTIFIC AMERICAN, INC.